AMERICAN MACHINIST

A JOURNAL FOR MACHINISTS, ENGINEERS, FOUNDERS, BOILER MAKERS, PATTERN MAKERS AND BLACKSMITHS.

VOL. 5, No. 38 WEEKLY. | NEW YORK, SEPTEMBER 23, 1882. | $3.00 per Annum. SINGLE COPIES, 6 CENTS.

COPYRIGHT, 1882, BY AMERICAN MACHINIST PUBLISHING COMPANY.

For Sale Everywhere by Newsdealers.

ENTERED AT POST OFFICE, NEW YORK, AS SECOND CLASS MATTER

Reed's New High Pressure Sectional Steam Boiler.

When it was announced, in 1880, that the English steamer Anthracite had arrived in the port of New York, and that her propelling power was derived from a boiler built to carry a steam pressure from 375 to 500 pounds per square inch, great interest was manifested by American engineers in watching her performance.

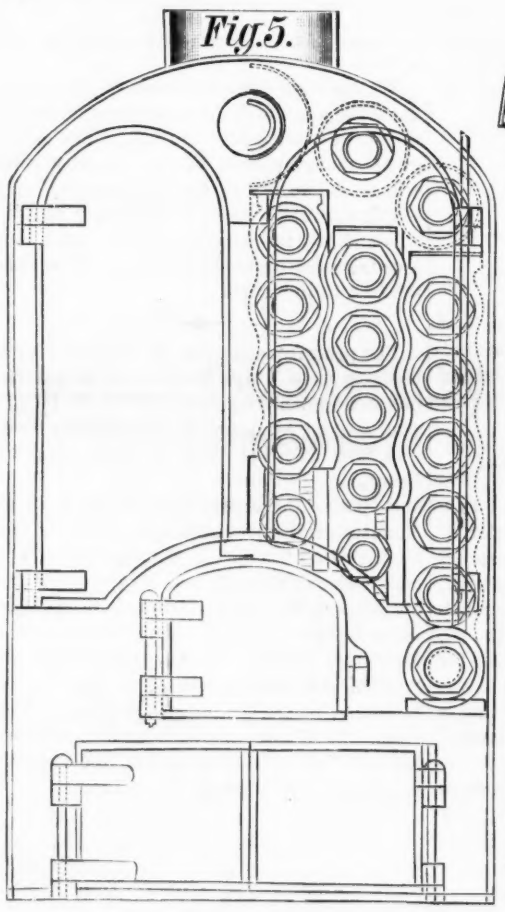
Tests were made at the Brooklyn Navy Yard, the results of which were published with illustrations in the AMERICAN MACHINIST of December 18th and 25th, 1880. These tests were read and appreciated by many of our engineers, and the advantages to be derived from the use of high-pressure steam were fully established in their minds, yet with one or two exceptions no one has profited by those experiments sufficiently to attempt the practical development of high-pressure steam apparatus on this side of the Atlantic. One of these exceptions is the designing and constructing of the boiler shown in the accompanying engravings. Fig. 6 shows a longitudinal section of this boiler through the center of steam drum, while Fig. 5 is a front view, showing the right-hand door open exposing to view the tubes, tube heads and return pipes. From these two views the reader will understand that this boiler is made up of a number of water tubes with return pipes or flues, placed within them. These tubes are united at each end to cast-steel heads, which go to make up each section. The details of construction may be stated as follows:

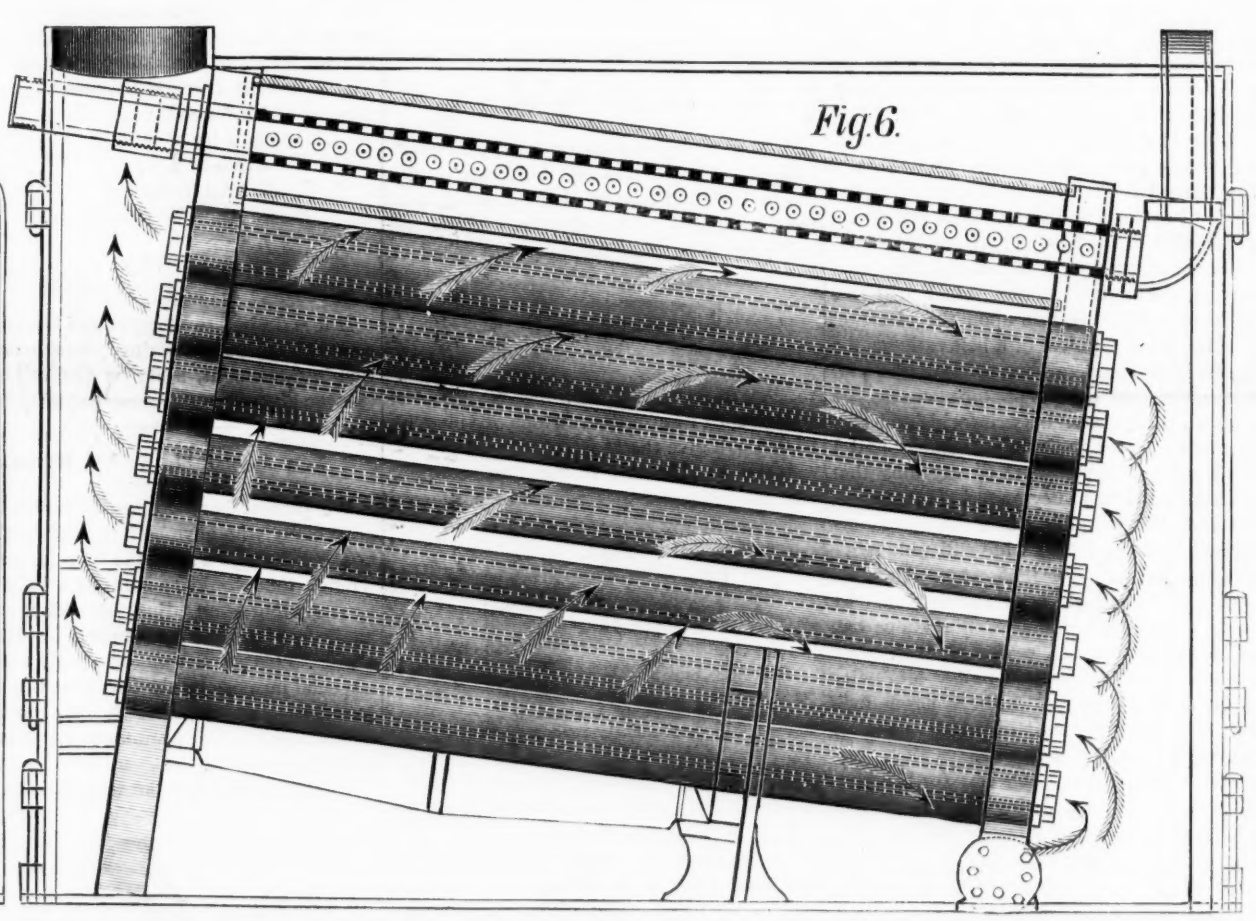
The cast-steel head, Fig. 2, page 2, for connecting the ends of the tubes for each section is recessed and has a projection bevelled at the sides to receive the ends of the water tubes, which are grooved, as shown in Fig. 1. The ends of the tubes are turned and grooved in a lathe, and in putting the section together, these tubes are placed in the heads, as shown in Fig. 4. Then the return pipes, shown in Fig. 3, are placed through the tubes, and the nuts upon each end screwed up with a large wrench. From this description it will be seen that these tubes leave a space for water between them. The nuts are of steel, accurately faced and neatly fitted to the threads upon the ends of the pipes, while the hubs upon the heads are planed true, so that, when the faced nuts are tightened, they make a water-tight joint without packing of any kind. The ends of the water tubes are also tightly pressed upon the wedge-shaped seats, so that tight and durable joints are insured in both cases. When the sections have been put together, they are set up and connected at the top and bottom, as shown. The sides of the furnace are formed by two large tubes at each side, while the tubes directly over the fire are of smaller diameter, increasing in size toward the top. As shown in the front elevation, each additional section from the side of the furnace toward the center of furnace, is elevated one-half the diameter of the larger tubes, so as to place the tubes in a zigzag position over the fire, thus dividing the furnace space to the best advantage between the grate and the combustion chamber, which is formed by the spaces between the small tubes over the fire. By having the larger tubes at the top, near the water line, a large surface of water is presented for the disengagement of steam, while the greatest heat is kept below the water line. It is claimed that this arrangement suffices to equalize the temperature and expansion of the tubes. It will be seen that the steel heads over the fire are small at the bottom, and increase correspondingly with the diameter of the tubes toward the top, leaving a space between the sections to remove the soot from the tubes, besides leaving a space for the gases to pass at the rear end. This arrangement of large and small pipes in vertical rows with the largest diameters at the top and the smallest at the bottom, is said to establish a good circulation; therefore a constant water level may be maintained.

The products of combustion, after having come in contact with the tubes in rising to the steam drum, are then directed in a downward course to the rear, and thence pass through the return tubes to the chimney. The steam drum is of small diameter, and put together in the same manner as the tubes, only the center tube, instead of being a return tube, is perforated, and forms the steam pipe. It is well known, that to take steam from only one point in a sectional boiler would not furnish as dry a quality of steam as where it is taken from a number of places. To accomplish this desirable object, the perforated steam pipe prevents the water and steam from rushing toward any particular part of the steam drum. The steam drum proper is composed of the five large tubes forming an arch at the top, with the largest one in the middle, from which steam is taken in the manner just described. The safety valve is attached to the back end of the steam pipe. It will be conceived then, that all parts of the heating surface can easily be reached, by opening the doors at the front and rear; and the heat that is not utilized by coming in contact with the external surface of the tubes is further taken up in passing through the return tubes.

These boilers are guaranteed by the builder to carry an every-day working pressure of 400 pounds per square inch, and are tested by a hydrostatic pressure of 700 pounds, and even higher for special work. One of these boilers has lately been used as part of a portable engine for plantation service, where it worked during several days' trial at a pressure of 325 pounds, driving the engines of a ploughing and traction machine. In transportation, it may be said that any part of this boiler may be handled by two men, either in setting up or taking apart. The boiler occupies a very small space for the power developed. By unscrewing the nut upon one end of the internal tube, it may be withdrawn and the interior exposed for examination, or for removing scale and sediment. A mud drum is also placed at the bottom. It is claimed, that by placing the tubes one within the other, thereby increasing the heating surface, a ten-foot boiler may be put in a five foot space. The water is also equally divided in an annular space, thereby exposing it in a most advantageous position to the action of the heat.

These boilers are made by J. A. Reed, at 120 Front street, Brooklyn, N. Y.





REED'S NEW HIGH PRESSURE SECTIONAL STEAM BOILER.

Belts.

BY CHAS. A. HAGUE.

As leather belts and iron pulleys are the most extensively used, the remarks in this article are confined to them. The driving power of a belt, independently of mere strength of material, depends simply upon the resistance to slipping, or to the friction between the belt and the pulley rim, and this resistance depends in turn very largely upon the character and availability of the surfaces of both the belt and the pulley. The surface of the belt must be sufficiently true, or flat, to ensure as nearly as practicable a bearing over the entire area supposed to be in contact; the belt surface must be elastic enough to admit of its clinging to the best advantage to the pulley surface, and the elasticity in the direction of the strain must be small.

For cast iron pulleys, there is no surface so good as that left by the broad tool coarse feed process, the pores of the iron being left as free and open as possible. On such a surface the belt is given an opportunity to take a much better hold than upon a polished surface. No pulleys have such a brilliant polish as those upon which the belts have been running for a long time; the pulley face finally becoming literally burnished by the slight but inevitable slip inherent in the belt system; the slip increasing gradually as the pulley becomes smoother. It would pay to put these bright pulleys into the lathe and run a coarse light cut over them, when they begin to exhibit a mirror-like surface.

Allowing that we have a proper belt and a desirable pulley, the friction or resistance is governed mainly by two things, viz., the angle of contact, and the pressure caused by the tension of the belt. There has been considerable discussion, from time to time, concerning the angle of contact, but I will rest my case in this direction upon the assertion that the driving power of a belt varies as the square of the angle of contact with the pulley. In regard to the pressure caused by tension, the question between wide and narrow belts comes in for a settlement, and I shall settle it (for myself) by deciding that with diameter of pulley and speed the same, the wide belt will drive the most, simply because a belt two inches wide will pull twice as much as a belt one inch wide. In other words, two one-inch belts running side by side, or one two-inch belt running alone will afford twice as much pulley contact, twice as much pressure upon the pulley, and twice as much section to pull with as a one-inch belt, the strain per unit of width being, of course, the same in each case.

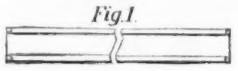
The accompanying table sets forth a simple manner of calculating the power that can be transmitted by different leather belts.

Width of Belts. Inches.	Leather.	Resistance per sq. inch of Contact. Pounds.	Least Diam. of Pulley desirable. Inches.
6	Single	.70	12
8	"	.70	16
10	"	.65	20
8	Double	.90	30
10	"	.85	30
12	"	.80	30
14	"	.75	36
16	"	.70	36
18	"	.65	36
20	"	.60	40
22	"	.58	44
24	"	.56	48
26	"	.54	52
28	"	.52	56
30	"	.50	60
36	"	.48	72
40	"	.45	80
48	"	.45	96
56	"	.45	112
30	Treble	.50	72
36	"	.50	72
42	"	.50	84
48	"	.50	96
56	"	.50	112

The figures in third column from the left, express in decimals of a pound the resistance to slipping, or angular friction per square inch of contact. The figures are given for a speed of from 2,000 to 4,500 feet per minute. The same results in power could be obtained at 800 or 1,000 feet per minute, by increasing the tension of the belt so as to produce three times the resistance, but this would be found to be unprofitable by reason of rapidly increased belt wear, and also of additional friction upon the journals. The tension necessary to produce the friction indicated in the table, is so moderate in extent that the 6" and 8" belts could be "thrown on" by hand; and it would only be necessary to tie, or to use belt clamps upon the larger ones on account of their weight. With a reasonable distance between centers of shafts, say from 30 to 60 feet, the belts will furnish sufficient working pressure by their weight alone, if drawn up within a few inches of a straight line when at rest. When operated under conditions implied by the table, the larger belts, if horizontal, may be made endless, and will run for years without any very perceptible wear.

To estimate from the table the power transmitted by a belt: first ascertain the area of the surface of contact between belt and pulley, by multiplying the length in

Fig.1.



inches of the arc of contact around the pulley rim by the width of the required belt; this gives the square inches of contact. In the third column from the left, opposite the belt under consideration, we find the

Fig2

resistance in decimals of a pound per square inch of contact; multiply this figure by the square inches of contact already found, and the result will be the *force* moved by the belt; multiply this force by the speed of

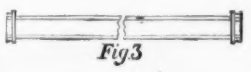
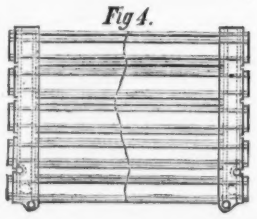


Fig3

the belt in feet per minute, and we have the foot pounds transmitted, which divided by 33,000 will give the H. P.

It will be observed in the third column, that the resistance per square inch of con-

Fig 4.



tact decreases as the belt is widened. This is because it is calculated to run the wide belts a little slacker than the narrow ones, on account of the general fact that with most materials the larger the piece the less the proportionate value. The wider the belt cut from hides, the more chances there are of weak places; and the wider the joints at the laps (not length of lap), the more chances against a good job.

The fourth column indicates the least desirable diameter of pulley to use with each width of belt. The 6" or 8" belts, for example, might be strained up to drive upon pulleys of 6" diameter; but, in order to obtain the driving force upon so small a pulley necessary to operate such belts up to what they should be capable of, they would have to be strained up too tightly. In this connection the idea suggests itself that, if fan and blower manufacturers could devise some means of getting their blast wheels up to speed without employing such small pulleys, they would confer a blessing upon manufacturers generally; but I suppose they will argue that people ought to buy larger blowers. They provide means for using two belts, but two belts driving the same shaft are not very desirable. If the work is light enough to enable them to work smoothly and continuously, one belt will probably do the work, and there will then be one less belt to care for. If a pair of belts are working hard, the difference in their elasticity will cause more or less trouble and loss of power, and the chances of stoppage of the machines are greatly increased. All things considered, the best belt practice is decidedly in favor of large pulley diameter, and comparatively narrow belts running at high velocities.

There is a loss of *positiveness* of motion of probably not less than two per cent. under the best conditions, due to slip and elasticity of the leather, so that, in calculating speeds through several lines of shafting driven one from the other, allowance must be made by adding the percentage of loss, as determined by the circumstances, to the required speed in each successive line. It is impossible to run the driven shaft up to 100 per cent. of the driver, for the reason that the belt goes on to the driven pulley in a slack state, and comes from it in a stretched condition, owing to the difference in strain between the pulling and the slack sides of the belt, so that the belt leaves the driven pulley at a surface speed a trifle greater than that of the rim of the pulley, and goes on to the driver, if no slip occurs, at a speed equal to that of the driving rim, but leaves it at a trifle slower speed. This effect is aggravated by excessive elasticity in the belt, so that the more rigid in substance a belt can be, and still retain sufficient elasticity to prevent shock, the better.

In calculating power transmitted by a belt, it is only necessary to consider the smallest of the two pulleys connected, and for ordinary cases where no measurements of the arc are made, it may be assumed that the average contact is $\frac{4}{10}$ of the pulley circumference. The following formula expresses the operation, in which formula:

D = diameter of pulley.
W = width of belt.
T = decimal in the table.
F = feet traveled per minute.

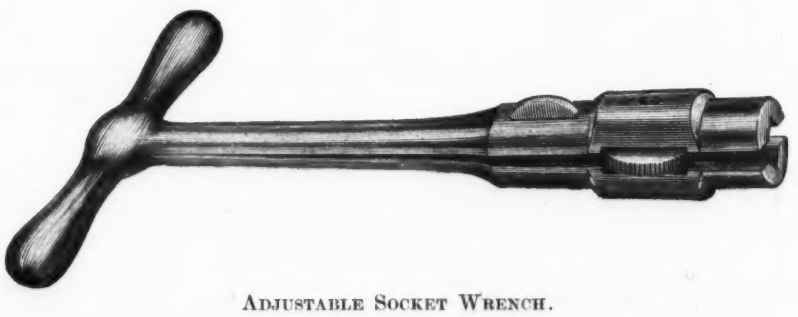
$$\frac{\frac{4}{10} D\ 3.14}{33{,}000} \times W.T.F. = \text{H. P.}$$

If it is desired to be exact and the angle of contact can be ascertained, whatever fraction represents it, must be used in place of the one given.

New Adjustable Socket Wrench.

We present herewith, as of interest to a good many who have had the satisfaction of hunting through a machine shop for a socket wrench that would fit a nut or a bolt head, an engraving of an adjustable socket wrench made by Hazeltine & Chantrell, Bridgeport, Conn. This wrench was originally made for a special purpose by the inventor, but it was found so convenient for general use that it was determined to commence its manufacture for the trade.

It will be seen that the wrench is made in



ADJUSTABLE SOCKET WRENCH.

two parts, securely fastened together at one end, leaving a divided socket end which is opened and closed by a right and left hand screw, turned by the milled thumb-wheel shown. It can be used in many places where an ordinary wrench cannot be turned; for a tap or reamer wrench, and for many other purposes that will suggest themselves.

Leatheroid.

A new article called leatheroid is being manufactured from paper, which promises to be of great utility. It consists of a number of thicknesses of cotton paper wound upon one another over a cylinder. The remarkable qualities of strength and adhesion it possesses are derived from a chemical bath, through which the paper is drawn on its way to the cylinder. The effect of the chemical bath on the paper is wonderful. Leatheroid, for the purposes it now serves, consists of about twenty thicknesses of paper; it is shaped upon or around moulds, while wet, into the form it is to represent, and will hold that form perpetually when dry. When dried it is as difficult as raw hide to cut with a knife. A company has been formed at Kennebunk, Me., for the manufacture of this article, and will at once build a large mill there for that purpose. This company is making, for introduction into the mills, roving cans, boxes, etc., to take the place of tin cans and wooden boxes. Cans made from this material are about one-fourth the weight of tin cans of equal size; while tin cans are liable to get bent, cans made from leatheroid are entirely free from this objection. They have the elasticity of thin steel, and no amount of kicking or handling will break them. Orders have already been received from several large mills for their roving cans and boxes, which are made seamless. This substance is also used for covering pulleys to a large extent, making one of the smoothest and most lasting coverings which can be obtained.—*Paper World*.

The Engineer and Iron Trades Advertiser of Glasgow, has the following:

MACHINERY FOR THE AMERICAN GOVERNMENT.—Messrs. Greenwood and Batley have in hand a set of rifle-making machinery for the American Government, and a set of machinery for making metallic cartridges and bullets.

We question the correctness of the information upon which our contemporary makes the above statement. If true, there are a great many people in this country who will be interested in knowing exactly why the Government finds it necessary to buy rifle-making machinery abroad, when our own manufacturers are competent to supply the best in the world.

The peaceful conquest of Mexico, "in a business sense," says *Bradstreet's*, is not being accomplished by merchants of the United States, alone by means of the railway facilities now afforded them in that republic. Enterprising exporters and others are fairly anticipating the completion of the lines of American railways building in Mexico, and are investing heavily in printers' ink. The New Orleans journals are regularly getting out editions for Mexico, printed in Spanish, advertisements and all. And now comes the Monterey (Mex.) *Revista*, containing the "cards" of leading houses in the United States, "done in the purest Castilian." The American Commercial Alexander will not have to "cry for new worlds to conquer" for many years to come.

The *Consulting Engineer* of Canada, is the name of a new monthly published at Toronto, Ontario. As it is issued under the auspices of the Boiler Inspection and Insurance Company, of Canada, it will undoubtedly look after matters to the interest of that Company, as well as engineering matters generally.

The *Dry Goods Bulletin* commences its thirteenth volume in a new dress, evidently "made to order." The *Bulletin* is always alive with matters of interest to the trade, and in "dressing them up" it ought to meet its reward.

In the presentation of B. F. Chappell's plumb-bob, in our issue of Sept. 9, his address was inadvertently given as South Windham, Massachusetts, instead of Connecticut, as it should have been.

Shop Kinks.

No. 36.

BY LEWIS F. LYNE.

SHOP WASH-SINKS AND SANITARY REGULATIONS.

I have visited a great many shops where the sanitary arrangements were carelessly, and I might safely say, in some instances, wilfully, neglected. Perhaps some shop owners and superintendents may think I am coming down to a rather fine discrimination of things when sanitary arrangements are mentioned. I consider it necessary to mention a few plain, practical facts to convince such individuals that too often are these apparently trifling things passed without receiving the necessary attention. I once worked in a shop which was well lighted and well heated, but there was no wash sink, so each individual was compelled either to invest a quarter of a dollar in a new bucket, or "chip" in with some one and divide the expense.

The characteristic of that particular shop was, that there were buckets everywhere. When the whistle blew, each workman grabbed his bucket and ran for the hydrant, and after he had filled it with water, hurried to some convenient place to wash up. I wish that words were at my disposal to picture in appropriate language the spectacle presented by that machine shop floor after the place had been vacated for the night, but I will not attempt it, only saying that there were slops upon almost everything in the building. After a while one of the workmen was taken sick, and the doctor pronounced the disease malaria.

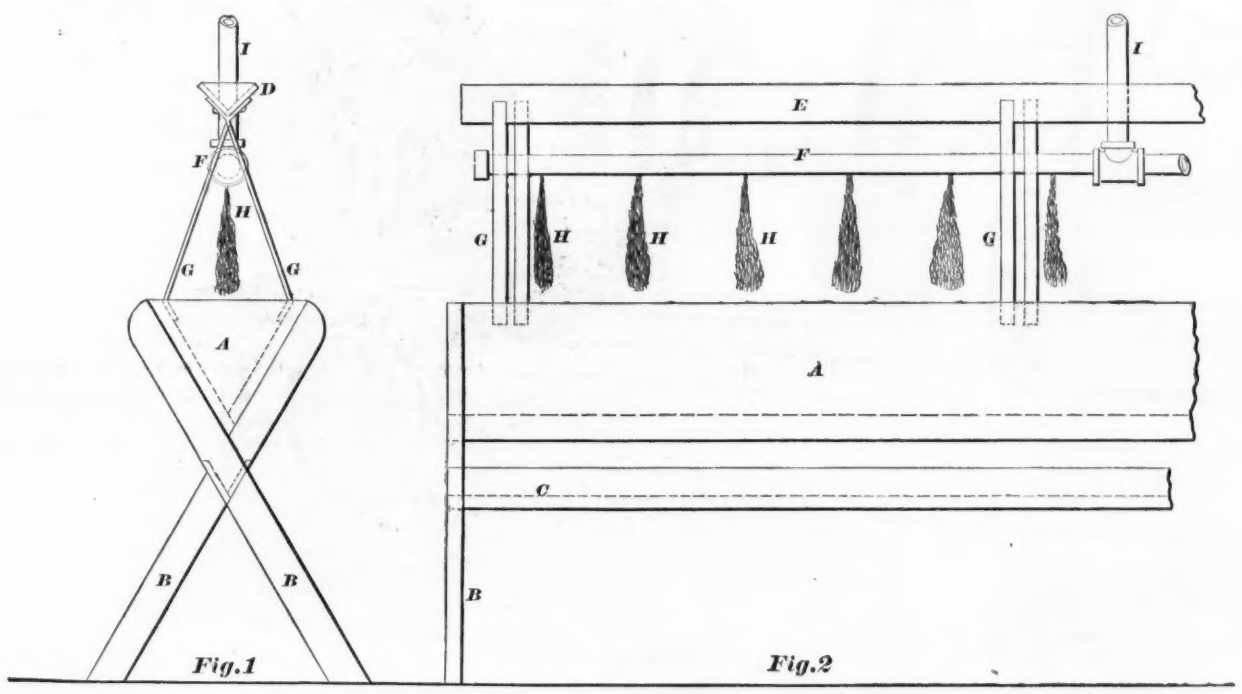
By and by others were taken sick in the same manner, until an investigation was ordered, which revealed that the space under the floor was covered with filthy water and decaying vegetable matter. A part of the water drained from the hydrant, while the rest was emptied from pails through convenient holes and cracks in the floor.

Besides the sickness incurred and the demoralizing of the workmen, the floor timbers were rotten and had to be renewed, so that several months' time was required to restore the shop to its former healthy condition.

I have worked in other shops where the workmen, while engaged upon vise work, would lean up against the bench and, crossing their legs, count the measured strokes of the file, wishing all the time that the whistle would blow, bringing to them relief. This state of things might ordinarily be due to the fact that some of the workmen had what is familiarly known as *spring fever*, or were constitutionally tired, but neither of these explanations was the true one in the instances referred to. The real trouble was that the atmosphere was loaded with malaria, and it was due to the dampness of the shop, which was greatly aggravated by the workmen emptying the contents of their wash-buckets under the floor.

The best way to avoid such a condition of things is to give the workmen a proper place to wash in, and not allow the use of buckets in shops. It is argued, with truth, that where sinks are used each man is frequently compelled to wash in the dirty, soapy water made by the others, which should not be. Another argument is that the sink, usually placed against the wall, is inadequate to allow all the workmen to wash at the same time, compelling some to wait, which is a point well taken. There are also other sensible arguments that could be advanced by workmen against the abolition of buckets; but I am still an abolitionist all the same, for the reason that I see no other plausible way to get over the difficulty, and have well lighted, heated, and healthy shops for mechanics to work in.

Owners of shops and factories often argue that sinks cost too much, and occupy room that could be used for other purposes. I am confident that the sink shown in the accompanying sketches, Figs. 1 and 2, representing end and front views of a simple and inexpensive wash sink, will meet all the objections offered. It consists of a simple trough *A*, made of soft pine lumber of a thickness proportioned to the width and length of the sink. There is but one longitudinal joint to make tight, and consequently but one to leak.



The joints at the ends are easily and quickly made, and if the work has been properly done, they will give no trouble. This trough is supported by the legs *B*, *B*. A second and smaller trough *C*, is made to hold fine sand, or other suitable substances, for scouring dirty hands, while a third trough *D*, *E*, supported by the flat iron brackets *G*, *G*, is for holding soap.

The wrought iron pipe *I*, having branches *F*, with a row of holes in the under side, furnishes streams of clean water, *H*, *H*, *H*, to each workman, so that there is no necessity of a single individual using dirty water, or having advantages inferior to the others.

The pipe *F* should be large enough to furnish sufficient water for ⅜" streams, eighteen inches apart, so that there may be no delay in washing up, as in sinks having the cock at the ends of the trough. This pipe may be easily supported by the brackets *G*, *G*, and connected with the hydrant or a tank, as may seem the most convenient. A waste and overflow pipe should lead directly to the sewer, or away to some place where the water can do the shop no harm. A sink made in this way takes no more room in width than a lathe, and should stand away from the wall so that the workmen can stand upon both sides. In this manner twice as many persons may be accommodated as when the sink stands against the wall. The cost is very light, and there is no shop in this country so poor that it cannot afford a sink of this kind.

I may say that the chief credit for this device is due to Ambrose Webster, superintendent of the American Watch Tool Company, in the center of whose shop at Waltham, Mass., is a sink similar in its main features to that herein described. As a further recommendation, I will add, that the shop of this company is a model of cleanliness and order.

The Marine Brake.

The funny man of the New York *Daily Times* goes for a recent mechanical invention (as exploited in some of the daily papers) in the following picturesque fashion:

"As the speed of steamers has increased the difficulty in bringing them to a sudden stop has similarly increased. It is now impossible to stop a fast steamer until she has run nearly or more than a mile after her engines have been stopped and reversed. If a steamer is running at a speed of sixteen or eighteen miles an hour in thick weather, and an iceberg is sighted within a half or a quarter of a mile of the vessel, it is quite impossible to stop her in time to prevent a collision. It is manifest that what is wanted is some sort of brake, by the help of which a steamer can be stopped at least as quickly as a railway train. This long-desired brake has, so the public is informed, just been invented and tried in Boston harbor, and it has proved to be all that could possibly be desired.

"The marine brake consists of two vast steel fans that are ordinarily folded against the side of the vessel near her stern, and that can be suddenly opened so as to expose a large surface to the resistance of the water. It was found, in the course of the experiments tried in Boston harbor, that this brake would bring a steamer to a complete stop within the distance of ten feet. The particular steamer to which the brake was attached was running at full speed when her engines were suddenly stopped and the brake applied. Before she had run ten feet she came to a complete stop, and those who witnessed the experiment felt that the success of the invention was demonstrated.

"If our ocean steamers can be stopped as quickly as was the experimental Boston steamer, ocean steam navigation will lose its chief peril—that of collision. The Captain of a steamer will lose all his fear of icebergs. No matter how thick the fog may be he cannot fail to see an iceberg of any dangerous size by the time he is within twenty feet of it, and the moment he does see it he can apply his brake and stop the ship before it even grazes the ice. The brake will also enable him to save a great deal of time in coming to his dock. The Captain of the Alaska, for example, can come up our bay at full speed; he can apply his brake when the ship is within eleven feet of the dock, and when she stops at a distance of twelve inches from the dock he can step ashore and fend her off with a boathook. In like manner time can be saved in stopping the ship for a pilot, or to pick up a lady's handkerchief, a small boy's hat, or anything else that falls overboard—operations that now require from a quarter to half an hour. Of course, when this brake is in universal use collisions between two steamers moving in opposite directions will be almost impossible, for if one steamer can be stopped within ten feet, two steamers could be stopped within five feet, so that it is hardly conceivable that collisions of this sort should ever take place.

"Perhaps, with a view to securing absolute safety, it would be well to provide a vessel that is equipped with the 'marine brake,' with a sliding bowspit 15 feet long and furnished with a seat for a lookout at the extreme end. This bowsprit should be so constructed that the slightest blow on its outward extremity would cause it to slide back within the knightheads. Now, were the lookout stationed at the end of this bowsprit to see an iceberg a few feet ahead of him he could warn the officer on the bridge and the brake could be applied in order to prevent a collision; and in case the vessel could not be stopped until the bowsprit struck the iceberg, the lookout would simply be pushed back on board the vessel without sustaining any harm. Or it might be desirable to connect the bowsprit with the brake, so that the moment the bowsprit should come in contact with anything the brake would be automatically applied. This plan would do away with the necessity of keeping any lookout whatever except when in the neighborhood of a coast too low to be hit with the bowsprit.

"It must be confessed that there are certain drawbacks to the use of the marine brake. Unfortunately, the speed of the steamer in connection with which the brake was tried in Boston harbor was not mentioned. Were she running at a speed of, say, one mile in six hours, it can readily be conceived that the brake might have safely stopped her progress within ten feet. If, however, the brake should succeed in stopping the Alaska within ten feet when running at the rate of eighteen miles an hour, the consequence would be that the masts and funnel of the Alaska would instantly go overboard, and that her passengers and crew would be thrown down with great violence.

"In fact, the more the matter is considered, the more evident it becomes that we ought to know the speed of the experimental Boston steamer. The whole value of the invention turns upon the rate of speed at which she was running and upon her size. If she was as large as the Alaska and as fast, the success of the marine brake is demonstrated. If, however, she was ten or twelve feet long, or was running at a speed less than that of a canal boat when battling with a head wind and partially disabled by colic in connection with her mules, the experiment proves nothing, and the value of the marine brake is yet to be ascertained."

The New Orleans Water Works Company, in advertising their want of an apparatus for removing the impurities from the Mississippi water as it is delivered, not only express a very common want, but one we fear that is hard to fill. This of course is not saying that it is impossible to accomplish all that is desired in this direction, and some inventor who may turn his thoughts that way may find pecuniary satisfaction in the end, for having done so.

The reaching of Monterey, 333 miles from Corpus Christi, with the track of the Mexican National Railway seems to have been the cause of great rejoicing at the former city. There is method in this rejoicing, and those who laugh first may also laugh last. However much the Railway Company may be doing for themselves, they are doing infinitely more for Mexico, for which no American will be sorry. The Company has already between 500 and 600 miles of road finished, in Mexico and Texas.

According to the *Dry Goods Bulletin*, strong efforts among strong men are being considered as to the success of cotton mills in California, and it is spoken of as quite probable that before the close of the present year, permanent arrangements may be made for the building of factories. Cotton direct from the South can be placed at a very slight freight charge in San Francisco; and from thence the manufactured goods can be cheaply transferred all along the Western Pacific coast and to the leading markets of Eastern Asia.

Investigating a boiler after it has exploded is something. It shows a laudable desire for information on the part of the inspectors. What is really needed is an inspector who will point out the weak spot in a boiler the day before it can explode.—*N. O. Pic.*

Kanawha, W. Va., owns the best gas coal in the world, but yet her streets are unligted, and her citizens go about with lanterns in hand, like historic heroes of old, hunting for places to put their feet.—*State Tribune.*

Saunders' Large Pipe Cutting and Threading Machine.

During the past eighteen to twenty years the demand for wrought iron pipe has steadily increased, owing to the various new and growing industries requiring the use of large quantities of pipe.

With the growing demand has also arisen an increase of diameters of piping, so that whereas, a few years ago, wrought iron pipe of five inches diameter used to be about the common limit for large pipe, eight and ten inches may now be said to be common sizes. Some of the steam heating companies are using twelve and fifteen inch wrought iron pipe for their mains. The demand for large pipe during the past few years has kept far in advance of the supply, and it is now difficult to get any considerable quantity of twelve inch pipe without more or less delay. The accompanying engraving is that of a machine for cutting and threading twelve inch wrought iron pipe. This machine is of entirely new design and detail.

At a glance the reader will perceive that it is very strong and powerful; at the same time the arrangement of its various parts is very convenient

The size here shown is No. 7, intended to cut all regular sizes of pipe from four inches to twelve inches in diameter. One of the principal characteristics of this machine is the exceedingly simple arrangement of gearing for changes of speed. These gears are placed upon fixed bearings, and are so proportioned as to give a nearly uniform surface speed for each of the different sizes of pipe.

By the introduction of these gears the necessary power is obtained, without the difficulty of using large pulleys and tight belts. The abrupt changes of speed experienced when cone pulleys only are used, are overcome by this system of change gears.

The pipe to be cut is placed in the hollow spindle, one end being held securely by an independent three-jawed chuck, as shown, while the other end is supported in line by plain bushings inserted in the end of spindle. Objection is sometimes made to these bushings, because the pipe does not all come of a uniform diameter, while at other times blisters will appear upon it, so that annoyance is experienced in getting it through these bushings. Frequently the latter is found to be impossible, while at other times it will be too small. When desired, a centering chuck having two jaws is placed upon the back end of the spindle, instead of the thimbles.

Upon the carriage are arranged holders for two sets of dies, besides a cutting-off tool. The front die plate, which is shown nearest the chuck, is used in cutting nipples and short pieces of pipe, which will not reach through to the back die.

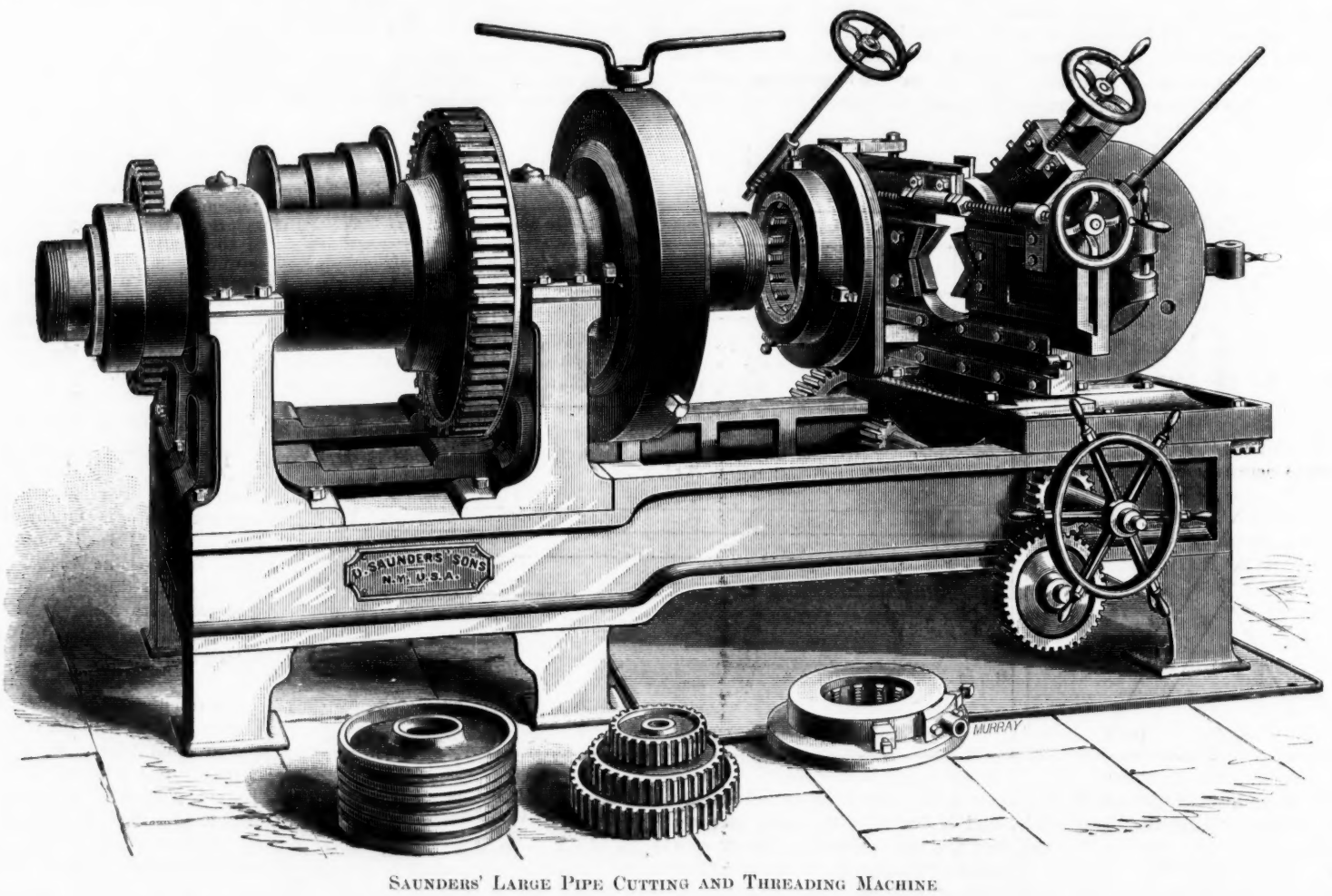
This advantage often saves the use of a nipple socket. This die plate is moved into the center of carriage when in use, and when not in use, is moved to one side upon slides provided for that purpose, as shown.

Two steel jaws are used for steadying the pipe while cutting it off, or in other words, after a piece of pipe has been threaded in the regular die at the back of the carriage, the die, which is hinged at one side and is held by a pin at the other, by the withdrawal of the pin is swung back out of the way. The pipe is then pulled through, and held in the right position to be cut off by the cutting off tool, operated by the upper wheel upon the carriage, while the two jaws operated by the wheel just below it are closed to steady the pipe during the cutting process.

The right and left hand screw for moving the steel jaws, also centers the pipe, so that the tool may cut freely and with the greatest rapidity. These jaws are also adjustable to compensate for wear. It will thus be seen that pipe may be alternately threaded and cut off, without removing the dies from the machine, thus effecting a great saving of labor. The carriage has a rack at each side gearing, with two pinions keyed to a shaft and operated by gears connected with the hand wheel, conveniently located at the side of the machine. By this mechanism the dies are brought squarely up to their work. For large pipe the gears give sufficient power to easily start the dies; whereas, with smaller pipe, some of the gears may be thrown out and the carriage moved with a quicker motion. By the use of the independent three-jawed chuck, used for holding the pipe, all wear can be compensated for and many difficulties experienced with the ordinary pipe chuck thereby disappear, as the pipe can always with this chuck be brought to the center. The gearing is extra strong in proportion, and the machine as a whole is designed to stand without injury the most severe tests to which a pipe machine is likely to be subjected in ordinary service.

The dies are of the adjustable expanding style, made to open by means of either a lever, or a worm and wheel, releasing the pipe at once, when the requisite thread has been cut, without stopping or reversing the machine. The dies for cutting twelve inch pipe have twelve separate cutters, and the ten inch die, ten cutters, which insures round joints and smoothly cut threads. Nipples, twelve inches in diameter and three inches long, are easily cut in this machine. The weight of this machine, with countershaft is 12,000 pounds. Each machine is set up and fully tested before leaving the works.

They are designed more particularly for use in manufacturing pipe, also in mills, and by steam heating companies, and are made by D. Saunders' Sons, Yonkers, N. Y.



SAUNDERS' LARGE PIPE CUTTING AND THREADING MACHINE

European Notes.

BY AN AMERICAN MECHANIC.

EISENACH, GERMANY, Aug. 14, 1882.

Editor American Machinist:

In spending part of a vacation at St. Gall, Switzerland, I took the opportunity of looking into the manufacture of Swiss embroideries, or Hamburgs, so called in America. To a mechanic the process is most interesting. The machines are generally found in private houses, both in the country and in towns. Sometimes they are owned by those who work them; at others they are hired. The small farmers have them in the basements or cellars of their houses, where, on account of the moisture, the work is better performed; but the health of the operator is injured by living in an atmosphere so moist and confined. The machines are simple, and are generally worked by three persons each—a man, a boy and a girl. The machine consists of an upright frame, say ten feet long and six feet high. Near the top, some four feet from the ground, are the double-pointed needles, some 100 or so, with eye in center. The general motion resembles that of a spinning mule. The needle frame moves backward and forward some three feet, or the length of the thread, which, in commencing, is about three feet. The needles pass through the muslin, and are caught at either side by a pair of pincers, the operator then moving the frame, by crank and gearing, back as far as the thread will allow. The needle frame is controlled in its movement in sewing the desired design by a pantographic arrangement of levers, worked by the operator, in accordance with an enlarged copy of the design, vertically fastened before him, so that one person does the work of 100, though, of course, each stitch consumes more time, comparatively, than would be required by an expert needlewoman. This class of embroidery is the chief source of trade of the place.

This year I am wandering in Northern Germany through the streets of the old town, celebrated as the home for a time of Luther. In the old castle on the hill one is shown the room he lived and wrote in. This castle—the Wartburg—is one of the show places of Germany, and is well worthy of its reputation.

In looking in the shop windows of the town, it is noticeable that in drygoods and Paris fashions the inhabitants are abreast of the times; while in hardware, cutlery, etc., they are much behind. Iron-work looks like that we see turned out by a Connecticut blacksmith, if not much more uncouth and cumbersome. The hardware in my hotel dates back half a century. The locks are ponderous affairs, but are examples of history and invention repeating itself, as they use a single lever instead of a ball knob, so common with us. This lever is again coming into fashion in New York, but here the whole lock is merely a latch, with lock and key added.

Judging from the street windows, American manufactures are being gradually introduced, as I found little tin glue-pots, spring scales, can-openers, twenty-five cent planes, tailors' shears, potato peelers, egg beaters, etc., many with the labels in English, and some copied and manufactured here, either with or without arrangement with the American patentee.

Among the little household native inventions I noticed a slicer, consisting of a disk with handle fastened vertically and across the feeding trough, not unlike some forms of hay-cutters, but having three slicing knives; also a wire-cloth money-drawer, so constructed that while using the upper compartments for change, the bills in the lower part are seen.

One of the most striking things to an American, while riding over the country, is the large proportion of women working in the fields—at least four to one of the men. On asking one of the housemaids about it, she said that women had to neglect their household duties to work out-doors, much

as they disliked it; that the men were largely employed in the towns or absorbed by the army, and that their life was one of much labor and poor pay, a farm-hand (male) getting 25 cents a day in winter, and 28 cents in summer. Many were emigrating to America, and many more would go if they could get the money necessary. The pay of this housemaid was, she said, less than $15 a year; but they are a robust and happy people. This girl, who expects to emigrate, wished to know if they had any dancing or music in America.

The support of the army is a great burden on these people. To-day three regiments came into town, part of the soldiers being quartered on the inhabitants. So, as you walk along the streets, you see chalked by the door the company and regiment, and the number of men quartered inside.

Little agricultural machinery can be seen. Most of the grain now being harvested is cut with the sickle. I saw but one cradle, and that a home-made one. But then the same is substantially true of Great Britain. You may cross the country, traveling hundreds of miles, without seeing a mowing machine, although the land is well adapted to them. The people are, however, from recent great losses of the hay crop, introducing several forms of dryers, with and without artificial heat.

Now the reader must not suppose that there is in Europe a great demand for American manufactures. Comparisons—here as elsewhere—are odious. The life, character, education, etc., of the people is so different from that of the same class in America that they cannot be compared. Time alone will change this. Let our people learn this fact in machinery as in metals: the best will be the most successful in the end.

We make the best (and cheapest) trunks and carpet-bags; the best fine machinery; the best, the strongest-bound books, weighing machinery, locks and keys, house hardware, etc., and Europe is flooded with cheap and poor goods of all kinds.

Nor should the American mechanic wish to change his country. My observations in the far East, in South America and Europe, teach me that, for opportunities for advancement, social and material, no country can compare with America; while in food, the wealthy here cannot have the variety and quality that any one may have there.

New Engine Lathe.

The accompanying engraving represents an engine lathe recently brought out by John Birkenhead, of Mansfield, Mass. This lathe, as will be seen, is neither back-geared nor screw cutting, Mr. Birkenhead having in his own works needed a tool of this class, adapted to work which it was designed for, without the addition of expensive parts not required for use, and which occupy room valuable for other purposes, and at the same time make the lathe less serviceable for light work.

The carriage of this lathe is held down to the ways by a flat spring, carrying rollers underneath, the tension of the spring being regulated by means of a screw.

The spindle, of large size, is hollow for convenience of working up long stock, and is made with conical or tapering bearings for close adjustment.

The feed driving cone is on the end of the spindle, and making the same number of revolutions as the spindle, drives strongly.

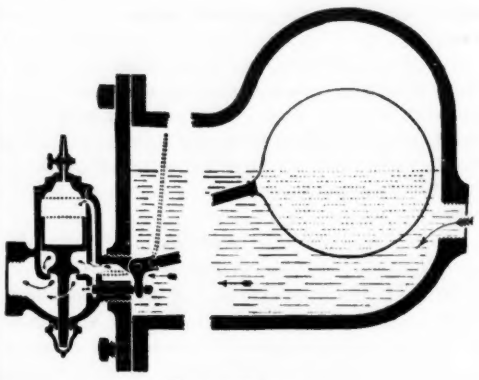
The lower feed cone can be readily raised or depressed to suit the exact length of belt—a matter of considerable convenience.

Attached to the lower feed cone is a pinion which gears into a wheel on the end of the feed rod. The latter gear is kept in place by a spring. On the feed rod is a collar, arranged to be made fast to the rod in any position desired. When it is required to provide a stop motion for the feed, this collar is adjusted in such a way that the carriage will, by coming in contact with it, move the rod endways, disengaging the gear and stopping the feed.

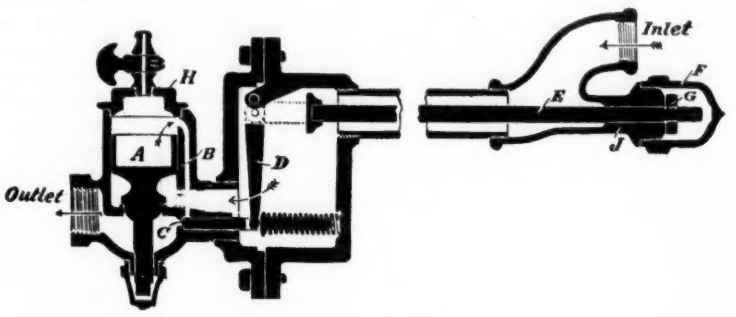
These lathes are made of different length of bed, and swing, as may be required.

The Curtis Steam Traps.

We present with this engravings of two kinds of steam traps, made by the Curtis Regulator Company, 50 Beverly street, Boston, Mass. The float trap is what is known as a No. 2. The principle upon which this trap works is the change of pressure on the top of the piston valve (shown at the left side of the engraving), while the pressure on the under side of the piston remains constant. To explain the operation, suppose the trap to be in its normal condition, that is, with the valve closed and the pressure equal on the top and bottom of the piston. In this condition, if steam enters there is no outlet for it, but if water enters it raises the float, which by suitable connection opens the secondary valve, thus connecting by the side passage the top of the piston with the outlet. This at once reduces the pressure on the top of the piston, when the unbalanced pressure underneath the piston lifts it, opening the main valve and permitting the water to escape freely through a passage, the area of which is nearly equal to the area of the escape pipe. Before the water in the trap is low enough to uncover a passage for steam, the operation of the float will have closed the connecting passage, thus equalizing the pressure on the top and bottom of the piston and bringing the outlet valve to its seat. It will be seen from this that the escape valve is open only when there is water in the trap sufficient to prevent the passage of steam, it being closed at other times.

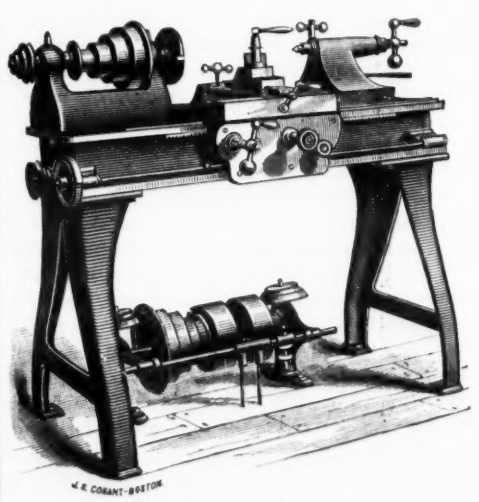


FLOAT TRAP.



EXPANSION TRAP.

In the trap here shown (a No. 2) designed to keep 3,500 feet of 1 inch pipe (or its equivalent) free from water, the float is only 4 inches in diameter, the case being 5 inches inside diameter, and 12 inches long. In order that a comparatively small float may satisfactorily do the work required of it, and at the same time not be influenced too much by friction, the leverage by which it opens and closes the small secondary valve is 100 to 1.



NEW ENGINE LATHE.

Another valuable feature in this trap is the location of the outlet valve outside the trap, by which it is easy of access for cleaning and examination. The floats are all tested to a pressure of 100 lbs.

The other trap illustrated is known as the Curtis expansion trap. In this trap the object aimed at is the overcoming of the objection to the usual expansion trap, viz.: the small annular opening of valves, the result of the small difference in expansion between the two metals used; this small valve opening clogging with any foreign matter in the water, preventing the valve from properly closing and destroying the seat. In this trap the outlet valve is operated by the piston *A*, as shown in the engraving. The space over the piston is connected with the outlet below the piston by the passage *B*, controlled by the small valve *C*. This valve *C* is opened against a strong spring by the contraction of the brass rod *E*, four to 5 feet in length, and situated in the iron pipe forming the outlet end of the surface to be drained. The contraction of this brass rod, *less* the expansion of the outside iron pipe, is about one-thousandth of an inch for a change in temperature of 10°.

In order to make this motion effective to open the valve sufficiently to work the trap at this small variation in temperature, the motion is multiplied 10 to 1 by means of the lever shown, thus opening the valve *C* one-hundredth of an inch, which is ample for the purpose. The opening of this valve connects the top of the piston with the outlet, thus relieving the pressure on top of the piston, and permitting the pressure on the bottom to open the outlet valve for a free discharge of water. When the condensed water is drained from the pipes until steam comes in contact with the rod *E*, the heat of the steam expands the rod and permits the spring to push the valve *C* towards its seat. This restricts the flow through the connecting passage, thereby increasing the pressure on top of the piston, which forces the outlet valve towards its seat and diminishes the flow of water, delivering it only at the temperature at which it is set to deliver.

The rod *E* is adjusted for any conditions desired, by removing the cap *F*, and turning the nut *G*. The spring against which the valve *C* is opened permits all the motion to be obtained by the rod under any fall of temperature down to freezing, while the slot in the outer end of the valve, through which the operating lever passes, is elongated to permit further motion of the lever after the valve is closed, thus providing for any expansion caused by an accidental increase of temperature, without danger to valve or seat.

The being able to discharge the water at any desired temperature provides for keeping the hot water in the pipes until utilized for heating, instead of discharging it at a temperature of 212°, thus wasting the heat. By opening the pet cock in the cap *H* (and this applies to both forms of trap), the pressure is removed from the top of the piston *A*, which then opens the outlet valve. This provides for blowing out the steam and water in the trap, together with the air and any dirt that may have accummulated. By removing the cap *H*, which seats metal to metal, the valve may be removed, cleaned and replaced in five minutes' time, no skill being required in the operation.

The Fair of the American Institute.

Preparations for the fifty-first annual fair of the American Institute are in active progress. The fair will open September 27, and we are informed that indications already point to a good display of machinery. The rooms will be lighted by electricity. Steam will be furnished by Babcock & Willcox boilers, which are now being erected.

LETTERS FROM PRACTICAL MEN.

Compound Engines.

Editor American Machinist:

In your issue of August 12th, "L. M." inquires why a compound engine should be more economical in the use of steam than a simple condensing engine, the expansion being the same in both cases. As suggested in your reply, it seems likely that less cylinder condensation has something to do with it. To have the expansion the same, I take it, the initial pressure would have to be the same, and the terminal pressure as it goes into the condensers the same. I cannot see that it is practicable to get as low terminal pressure in a simple as in a compound engine. Perhaps I am wrong about it.

Leave cylinder condensation out of the question, and follow out the operation of the steam. In the absence of the indicator, take the well-known rule that the pressure is inversely as the space occupied. Suppose the initial pressure to be 64 pounds, and the cut-off at ¼ stroke (practice has demonstrated that this is as early in the stroke as steam should be cut off). This, by the rule, will give 16 pounds terminal pressure to go into the condenser of the simple engine, and 16 pounds terminal pressure in the high-pressure cylinder of the compound engine, to be exhausted into the low pressure cylinder, which is four times the capacity of the high-pressure cylinder, and the steam goes into the condenser at 4 pounds pressure instead of 16 pounds, as in the case of the simple engine.

The above explains, as I think, why it is impracticable to get the same degree of expansion, in both cases, with both engines at their best.

The benefit of this low terminal pressure, I think, is not wholly due to expansion, but largely to a greater percentage of gain from atmospheric pressure. Suppose the amount of benefit from use of vacuum, after deducting the power consumed in working the air pump, to be 8 lbs. Then steam going into the condenser at 16 lbs. would give a benefit of 50 per cent., and at 4 lbs. the benefit would be 200 per cent. gain by atmospheric pressure.

It will not do to use low boiler pressure to get a low terminal pressure, because it costs more to keep up low steam than it does to keep up high steam. Pressure rises fast in proportion to the temperature. Steam at 212° is only at atmospheric pressure. Double the temperature, making it 424°, and we have 300 pounds pressure. Every fireman knows that it takes as much fuel to get up the first 20 pounds of steam as it does to get the next 40 pounds. And yet, if we have the initial pressure too high in the simple condensing engine, we do not get the low terminal pressure, and throw too much upon the air pump. Herein the compound engine has the advantage. It will take higher steam and deliver lower steam than the simple engine, and get more benefit from expansion, a larger percentage of gain from atmospheric pressure, and throw less work on the air pump.

Defiance, Ohio. ANTHON.

An Electro Motor.

Editor American Machinist:

Having noticed in many papers throughout the country accounts of the new electro motor invented by Mr. J. B. Atwater of Chicago, a working model of which I have

seen through the courtesy of the inventor, I should like to ask a few questions.

First, let me state that the motor derives power from a Bunsen, or other ordinary battery, working through a peculiar form of electro magnet, discovered by Mr. Atwater, and from which he calculates on deriving a power cheaper than steam power. Amongst other uses, he proposes to apply this cheap power to a dynamo, to produce a current for electric lighting purposes cheaper than can now be done by steam power; the only expense in maintaining this power, is in keeping up the battery.

Now on the basis of the inventor's calculations, should not the dynamo current derived from the apparatus be as much greater than the battery current put into it, as the cost of a battery current now exceeds that of a dynamo run by steam power, plus his calculated saving on steam? And if he gets a greater current out of his apparatus than he puts into it, can he not shunt a portion of the derived current through the motor, and dispense with the battery?

Then, would he not have a *perpetual motor*, producing a considerable current, at no expense? Does not this show his calculations to be wrong, and the cost of his power to be greater than steam? Does this show that the correct way to work for a cheap electro motor is to work for a cheap current?

ALBERT W. BUEL.

Class '83, Troy Polytechnic.

Making Double-Beat Valves Tight.

Editor American Machinist:

Having had considerable experience with double-beat, equilibrium, distributing steam valves, I can say that it is almost impossible to make them really steam tight.

I have tried grinding each of the seats first, but with no better success; so at last I determined to do away with the brass annular seat rings.

I drew out these seats, turned the cast-iron framing as a new seat, and had new brass valves to fit with grinding. Contrary to the opinions of many, the success of this plan has given the utmost satisfaction.

Since the alteration has been made, I have not had the least trouble, and the valves never require looking after. Through curiosity, after they had been in use for some time, I had the covers taken off, and the bearing surfaces presented a true, burnished appearance, in this respect far exceeding my expectations.

I write this after reading your answer to question 280, in No. 33 of the AMERICAN MACHINIST. H. FOSTER.

Adria, Italy.

Copying by Blue Process.

Editor American Machinist:

The inquiry, Sept. 9, as to detail of blue process of copying, suggests one or two other points that may be worth noticing.

Some kinds of paper seem to absorb the solution to such a depth that there is no white stratum of the paper left to appear as white after the exposure and the washing. With such paper, a good deal of care, and some practice, is required to get the sensitive coating even, and yet to prevent its absorption by the paper. Some grades of bond paper are troublesome in this respect, although desirable for lightness and strength.

It should be remembered that what is wanted is a sensitive *coating*, and not a saturation of the substance of the paper, and hence a sized and well calendered quality of paper will give the best result.

Elgin, Illinois. P. BARNES.

Solution for Blue Process Copying.

Editor American Machinist:

Among the "Questions and Answers" (AMERICAN MACHINIST, September 9th), "W. H. W." writes that he has trouble in getting clear lines on his blue tracing.

I had the same trouble when I first tried (some two years ago), but afterward found that the paper had as much to do with it as anything else. You want a paper well sized and calendered. I use unruled ledger paper, and when I want a deep blue copy I only use two-thirds as much water in the solution as the receipt generally calls for. Thus:

1¾ ounces of citrate of iron and ammonia, dissolved in 5 ounces of clear water; 1¼ ounces red prussiate of potash, in 5 ounces water. Dissolve separately, and mix in dark room.

Use great care in having the red prussiate of potash crystalline in structure.

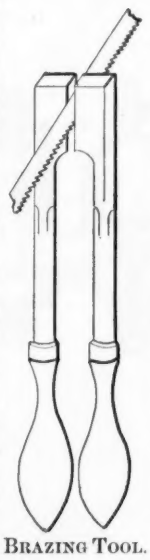
Soft, unsized paper allows the solution to soak in, and will not wash off, but leaves the lines yellow, or bluish green. R. BERT.

Cincinnati, Ohio.

Tool for Brazing Band Saws.

Editor American Machinist:

I have taken the AMERICAN MACHINIST for a few months only, but in that time I have received many valuable ideas in regard to "shop kinks," and take a deep interest in "Letters from Practical Men," as I am sure every mechanic must.



BRAZING TOOL.

As I have seen nothing in the paper relating to brazing broken band saws, I herewith inclose a sketch of brazing irons, which I have found much better than tongs for that purpose. They are cheaper to make, more durable, and in removing them from the saw it does not draw the splice apart, as do the tongs. The upper iron is slowly drawn away, leaving the under one until the saw becomes chilled.

This tool may or may not be new to some, but I never have seen it used in other shops. I think if any one will give this tool one trial, the tongs will go into the scrap pile, or to some other use.

Oakland, Cal. PROGRESS.

Battery of Boilers.

Editor American Machinist:

In the AMERICAN MACHINIST of August 26, page 6, is a letter from a Philadelphia engineer claiming that the expression, "a battery," when used of two or more boilers set together, is wrong. All through the war we used to hear of four or six gun batteries. In electricity we know for many years past of batteries, consisting of cups or cells; these may be, more or less, from a dozen to a hundred. On ships we hear of larboard or starboard batteries. In manufacturing concerns and in mechanical works, and wherever boilers are used, we hear of "a battery of so many boilers." In steam engineering, a battery of boilers has been supposed to be a number of boilers for use collectively, or in one line of duty, as, for instance, the rolling mill battery, the wire mill battery, &c., all referring to different nests or groups of steam boilers at different places through the works. These specific appellations refer to the duty to which the steam is put. Perhaps not many of the terms which usage has allowed and approved, will be found either in Worcester or Webster, and without doubt very many modern terms, as applied to steam engineering, military engineering, the working of iron, or many other lines which might be specified will neither be found in Worcester nor Webster. They are, however, perfectly familiar and understandable by men of good sense and fair capacity, who are every day in contact with the mechanisms to which they apply.

Boston, Mass. A. F. UPTON.

"Battery" of Boilers.

Editor American Machinist:

Permit me to express my dissent from Mr. Barnet Le Van's views on the use of terms as applied to a connected series of steam boilers. I like the word "battery" for such an arrangement; it is clear-cut, sharp, and emphatic, and euphonious as well.

I do not favor entire confinement to literary precedent in dealing with mechanical subjects. All words must have an arbitrary birth, and it is but a question of time and usage, to so train the organs of hearing as to gain currency for any proposed combination of sounds to invariably indicate a given idea or sentiment. It is true that Worcester does not authorize the use of "battery" in connection with steam boilers—neither does Webster—but Knight does, in the following plain language: "Battery—a number of objects or devices in position, as of *guns, plates, kettles*, &c."

If a word be a combination or modification from some foreign language, the arbitrary stage is only removed into the past a few years or generations, but in nowise altered. "*Batter*," the root upon which "battery" is raised, seems to apply to anything from demolishing a stone wall to beating eggs. Why should not "battery" have as wide a range of meaning, since confusion is wholly prevented by the context? It certainly is as logical to call a number of connected steam boilers "battery" as a number of Leyden jars or galvanic cells, unless we cut away all conditions except the one that contemplates beating or physical attack, in which case a single Leyden jar would rightfully hold the name, while a single galvanic cell would not.

Blackfoot, Idaho. C. C. HILL.

Filing.

Editor American Machinist:

If one were to look over the inquiries in the back numbers of the AMERICAN MACHINIST, he would be surprised to see how often the same questions are asked. Why? Because there is constantly a new and younger class coming up that read the paper. This is my excuse for writing on a subject that, to many, would seem to be worn out. In these days of special tools, milling machines, &c., how many young machinists really know how to use the file? Go into a machine shop, employing one hundred men and boys, and ask each one if they know how to use a file; they will quite likely all answer in the affirmative, when in reality there might not be over half a dozen that could do a creditable job.

To be expert in the use of the file takes time, and more of it, than to learn the use of all the other tools in the shop. To use a file properly it is necessary to use reason and judgment with it. I have seen a good file spoiled in the first pass over the work, and the operator would declare the piece was so hard that it could not be filed. Why? Because the file is pushed over the work at the rate of about sixty times per minute, and perhaps pressed as hard on the return as on the forward stroke, thereby breaking off the teeth. And again, by holding the file so that it jumped and clogged, and every time it jumped it would leave a few teeth; or by placing the work in the vise in such a manner that it could spring, which is denoted by the squawking noise so often heard in filing saws, and which allows the work to spring from one tooth to another, if not breaking the teeth, knocking the sharp edge off.

Now, suppose that you have one of the many tools that are tempered as hard as possible, and still be able to sharpen with a file. Put it in the vise in such a way that it will be rigid as possible; see that your handle is firm on the file; then take hold of it as though you intended to hold it as firmly as if held in the tool-post of a lathe; pass over your work slowly and deliberately, and on return stroke do not touch the work. Does it cut? Of course it does; do so again and again, it cuts every time, and will keep doing so until you get in a hurry and neglect to obey instructions, when you will see a white mark the whole length of your file where the teeth are gone.

So much for hard metal. Now try to file a piece flat. Put it in the vise, and stand up and see if your elbow will pass over the vise when your arm is against your body. If not, stand on something that will raise you up until it will. Then place the file handle in the palm of your hand, with the thumb extended and resting on the top of the handle; the thumb of the other hand on the end of file. Now move the file over the work lightly and learn the motion you are to make with each hand; bear on just hard enough to cut without any jumping. If you will do this, and never use a file without trying to see how flat you can file, you will soon be surprised to see how easy it is.

Ithaca, N. Y. H. REYNOLDS.

Reginald Augustus and His Troubles.

Editor American Machinist:

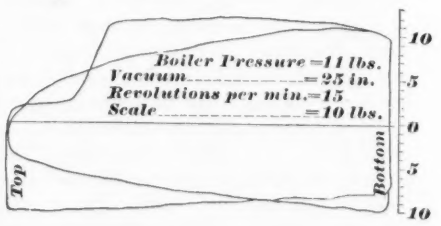
Is it possible that a recent letter in the columns of "Letters from Practical Men" is a reality, is something tangible and not an emanation from dreamland? I read the letter twice, laid the paper down to attend to some work, at my leisure carefully re-read it, and concluded that Reginald Augustus was giving us humbler brethren of the craft some taffy, or he has yet to learn how to judge men. His "superior education" has not given him the "superior advantages" he boasts of. Better by far for him to have kept Dunn in as his foreman and gone into the shop "and made short work of mastering the business as told him by the greasy practical men." He need not have lowered his dignity or have come down from his position as a rich banker's son. The habits of a gentleman are not incompatible with the skill of a machinist, nor the overalls in anyway a disgrace to the broadcloth suit. There is nothing derogatory in the fact that a man can skilfully handle the engine of a big ocean steamer, and be able to design the same kind of work for another ship. Off the steamer, out from the shop, he can be just the same gentleman, as fond of his classics as in his early graduate days.

Who can wonder that his foremen leave him? The wonder is that a man of good judgment, and having a spark of manhood inside his vest, will stoop to accept a position in a shop where the office boy is encouraged to tattle, and the proprietor indulges in "private questioning" amongst the men.

If Reginald Augustus will read the back numbers of the AMERICAN MACHINIST, especially Chordal's letters, he will see in them how another banker's son determined to learn something of the machine trade, and how he came out of his tribulations a bright young fellow, who understood what it was to be a man; a mechanic as well as a gentleman.

If Reginald Augustus is not inclined to pitch in even at this late time and "learn the trade" with the greasy practical men, then he reads the AMERICAN MACHINIST in vain, and would not accept the foreman that would and could run his shop, even if made to order for him.

Chicago, Ill. NORMAN.



A Puzzling Indicator Diagram.

Editor American Machinist:

I send you an indicator card, which has long been a puzzle to me, and I hope that some of the numerous and intelligent readers of the AMERICAN MACHINIST will explain the cause of the defect shown at the top end of cylinder by the accompanying diagram. While our ship Rosario was in port, the chief engineer had the steam-chest cover removed, and with great labor turned the shaft, so that the movements of the valve could be examined. As far as he could see, the valve had the proper lead at each end. The engines were of the oscillating type, 54" in diameter, with a stroke of 6 feet. Both piston rods were connected with one crank pin. The valves were plain slides, operated by rock-shaft arms leading to the outside of the centers of trunnions, at which points they connected with the link brasses. All diagrams taken from the forward engine compared with the one here shown, while those from the after engine were very good. The pair of diagrams here shown were taken under the following conditions: Boiler pressure, 11 lbs.; vacuum, 25 inches; revolutions per minute, 15; scale of spring, 10 lbs. to the inch. Links placed at full throw. S. D.

Shop Foremen.

Editor American Machinist:

The experience of R. A. Hunt in finding and keeping a suitable foreman, as related in your issue of the 9th inst., is one often repeated, in shops too, managed by men of, perhaps, more ability than is possessed by Mr. Hunt. All the qualities of a good foreman are seldom found in one man. The first foreman I worked under was a good workman, but having grown up in the shop, was too easy with the men. The next had only one pet among the men, with whom he would go hunting or fishing once a week, besides on Sundays.

The next was too high toned for a small shop and he didn't stay long. Number four was a rusher, but had a way of his own, and that "way" did not suit the proprietor. One had learned his trade in England, and another in a Yankee machine shop.

The next would probably have suited, if he could have kept sober. Finally, the man who suited all hands best, and who stayed longest, was, to use a common term, no mechanic at all. But he had the knack of managing the men, and could get out more work with the same force than any of his predecessors.

I used to wonder at this man's success, and after studying him in the light of subsequent years, have learned some things about the requisite qualities of a foreman.

In the first place, "Rosey," (that was the name he went by) never spent time trying to get a man to do a job in some new way that he had never seen employed before, for the very good reason that he had no way of his own. He never tried to make a hand of himself, for that would have exposed his ignorance.

He never spent his time or that of the men in getting up new tools or devices, but made the most of what he had. Work was never required to be done over. Often the reason for this was, that he was a little near-sighted, but if he could have seen better he probably would not have known the difference.

This trait, if good or bad, may be questionable, but let this be as it may, it went to his credit with the "bosses."

On one occasion one of his men worked on a small portable engine several days, vainly endeavoring to set the slide valve, which was actuated by a "return crank." The draughtsman had made a mistake, and neither Rosey nor the workman knew how to correct it. Rosey finally found a man in the shop who knew where the trouble lay. The man who couldn't do the job was discharged, and things went on all right, the proprietors none the wiser for what had happened.

For a position in any of our Government works, or in many private shops, Rosey would not have passed muster, but my experience with many foremen inclines me to the belief that I would as soon have such a man as any of the many varieties in charge of machine shops.

Much might be said on this subject, and, of course, much depends on the character of the shop and the work done. But Rosey could get out the work, and that is the main object in having a foreman.

DYNAMICUS.

A Convenient Gauge for Tapers.

Editor American Machinist:

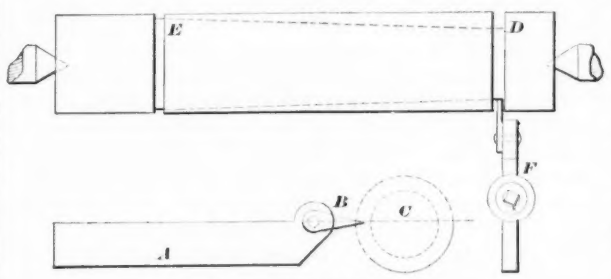
I have repeatedly seen in the AMERICAN MACHINIST various methods for finding tapers—in other words, setting work in lathes to tapers. Some time ago I saw such a device where a wedge is used. The tool I am going to describe is inexpensive and easily made, and, when once used, will be highly valued.

I first conceived the necessity for such a tool in 1868. Since that time nearly every lathe hand in the shops in the place where I am at work possesses one of these gauges. The accompanying sketch will give a fair idea of this tool and its construction. The lathe-centers are represented with a piece of work centered upon them and ready for turning. First find the two diameters of the hole to which the taper is to fit, then, with a parting tool, cut down at *E, D* to a diameter of about $\frac{1}{32}$" above the required size.

The next step is to move over the tail center until the gauge *F* will touch lightly at *D, E*. This gauge is simply a piece of tool steel, of the shape shown at *A*, to which is hinged a small steel finger, *B*, $\frac{1}{16}$" thick, having the rivet driven sufficiently tight to make a moderately stiff joint—without shake. The rivet should fit neatly in both holes. By placing this gauge in the tool-post *F*, so that the rivet will be precisely level with the lathe-centers *C*, and letting the finger just touch at *D, E*, the right taper will be obtained. It is necessary to set the edge of the turning tool exactly at the center to get the exact result anticipated.

When these simple directions have been strictly observed, the results will be entirely satisfactory. I mention this gauge because of its merits, and, while it may be old to some, yet I believe there are many who have never seen it. It far surpasses the wedge in my estimation. Any mechanic using one of these gauges will somehow manage to make one for himself, and will always carry it in his tool-box as a valuable adjunct to his kit.

Reading, Pa. MAHLON SHALER.



GAUGE FOR TAPERS.

The Pennsylvania Railroad Signaling Apparatus.

It is said that from the signal tower upon the elevated part of the Pennsylvania Railroad at Seventeenth and Filbert streets, Philadelphia, more trains are signaled within a given time than from any other signal position in the world. This tower is the position from which all trains entering or leaving the new Broad street station are controlled, and it is somewhat of a curiosity to know that even at the largest railroad junctions in and about the city of London, England, the number of trains signaled daily falls short of those passing the tower alluded to. The number of trains entering and leaving the Broad street station every twenty-four hours is said to be about eleven hundred and forty, yet the interlocking switch levers and signals operate with such precision that so great a number of trains pass and repass without delay in accomplishing their daily trips.

These levers are so arranged that a signal cannot be thrown to indicate a clear track, until the necessary switches have been thrown to make the track unbroken. Then, when the signal is thrown for the train to proceed, the movement of this lever locks each of the switches, which might otherwise be carelessly thrown and cause an accident.

After the train has passed, the signal is thrown to indicate danger for that particular track, after which the switches may be set for other tracks. So perfectly are these combinations arranged, that the men in charge of the signals cannot throw a lever wrong through a mistake.

The apparatus as a whole, when examined by a novice, appears very complicated, but when fully understood, is very simple, working in a thoroughly automatic manner, and relieving the tremendous responsibility and care which would otherwise harass the brains of the signal men.

This admirable signal and switch system is the result of the combined efforts of some of the best English and American railway engineers and managers. For many months it was their constant study to produce an apparatus which would fill every requirement of this particular location, and they have succeeded admirably. Provision has also been made in the construction of this apparatus, in anticipation of a still further increase of traffic, which would require the movement of extra signals and switches.

Furnishing Steam for Small Power in New York City.

Contingent upon the success of either or both of the two companies at present engaged in putting down pipes and completing plants for furnishing steam for power in New York City, is a matter of no small interest to steam-engine builders—especially to the builders of steam engines for small power. If the success of these enterprises is assured, it is probably not too much to say, that in thousands of instances small power will be used where no power is used at present.

Usually, the use of a steam engine, however small, implies the use of a boiler, and generally the surrendering of valuable space, and also calls for the attention of one person.

On the contrary, by using steam from the company's pipes, only the engine is required, which will occupy but little room, and if of good construction will require only nominal attention.

By this means, if steam is furnished at reasonable prices, the cost of small power will be so far reduced as to make it almost universally attainable, incidentally affording advantages to small manufacturers which they do not now possess.

It is believed, that the care with which the work connected with these enterprises is being done in this city, will either render them successful, or demonstrate that the entire plan of distributing steam for power in underground systems of pipe is not commercially feasible. The engineers in charge of the work here seem to attach but little weight to partial failures in other instances, apparently believing (as many others do) that these failures were due to causes that were quite plain and which ought to have been avoided, causes sometimes, but by no means always, of a mechanical nature.

Success in New York undoubtedly means the rapid and general adoption of the system in other cities, since its advantages are too manifest to require argument to demonstrate.

Automatic Expansion Gear.

We condense from *Engineering* some remarks made at the recent meeting of the Institution of Mechanical Engineers at Leeds, England, on matters of general engineering importance.

In discussing a paper read by Wilson Hartnell, of Leeds, "On Governing Engines by Regulating the Expansion," Mr. W. H. Maw said he had under his charge six engines fitted with automatic expansion gear. The largest of these engines, which was started about five years ago, indicated from 180 to 190 H. P., and was capable of indicating 250 H. P. easily. It was employed in driving printing machinery, and was subject to very great fluctuations of load, 60 to 70 H. P. often being thrown off suddenly. This engine had a fly-wheel 10 feet 6 inches in diameter, with a 6½ ton rim, running at 115 revolutions per minute, the engine being coupled direct to the shafting. He believed that this heavy fly-wheel had much to do with the steady action of the governor.

Prof. H. S. H. Shaw, of Bristol, said, in relation to size of fly-wheels in large engines, it was possible to have a heavy wheel, but in some types of small engine a large wheel was not admissible, and this was the case with many electric light engines. *Perfect* regulation, however, was not attainable by any governor at present known, as some change of speed must occur before any governor can act.

What was required was some means of storing power, so that when an increase of load occurred, the storage could be drawn upon, and *vice versa*.

Mr. T. R. Crampton pointed out that it was undesirable to expand below the pressure which would overcome the friction of the engine. In many cases it was undesirable to employ an expansion valve, while the results which could be obtained by throttling were far better than was generally allowed. The throttling, however, should be done properly, and he had many years ago devised an arrangement by which the steam was throttled in the steam passages, just before it entered the cylinder. In such an arrangement, the boiler pressure was practically attained in the cylinder during the early part of each stroke, while the piston was moving slowly. As the speed increased, the pressure fell, owing to wire drawing, the increase in speed of piston giving the expansion. In conclusion, he objected to the undue importance, which was too frequently attached to the attainment of sharp cut-off corners in indicator diagrams. The best diagram was that which was given by an engine when working with the greatest economy, and it by no means followed, that this form was that which may theoretically be regarded as the most perfect.

Mr. Druitt Halpin observed that the governor under discussion (Hartnell's) represented the extreme development of governors in one direction, namely, that in which a large amount of what might be called brute force was provided to directly operate expansion gear promptly. At the other extremity of the series were the Corliss and kindred gears, in which the governor did not do heavy work, but merely caused this work to be done by other contrivances. In Mr. Hartnell's paper it was stated that in one arrangement of his "the governor has little or nothing to do in order to hold the eccentric in place, and freely adjusts it at such times as the governor and eccentric are acting in the same direction." He (Mr. Halpin) had once employed an arrangement of governor which he had intended should act in a similar way, but he found that the governor did not take advantage of its opportunities, and the arrangement was therefore a failure.

A new device for opening iron shutters from without, in case of fire, has been invented by a New Orleans fireman named John Cotayer. The device is described as an electrical apparatus, which is put in motion by the touching of a button on the first floor. An attachment makes it self-acting in case of a fire, or even of unusual heat within the building

A Correction.

Prof. John E. Sweet, of the Straight Line Engine Company of Syracuse, N. Y., writes us:

In your notice of the Solvay Process Company's Works, in this city, which appeared in the AMERICAN MACHINIST of September 9th, you are in error in saying that the large gas compressors are being built by the Straight Line Engine Company. The contract has been let to the I. P. Morris Co., of Philadelphia.

According to the *English Mechanic*, an 8-horse portable engine can be obtained in New South Wales (Australia) for about $1,250, but in Victoria, owing to the duty, the cost is nearly $1,500.

The *National Labor Tribune* has the following in reference to a new invention:

J. B. Atwater, an inventor of some prominence at Chicago, has secured patents on a unique and entirely new motor. It is founded on this principle: Two poles of an electro magnet are changed to a point distant from where they are usually located. By this transfer a stroke of five to thirty inches is secured on a reciprocating or an oscillating engine without breaking the current which connects the battery with the motor. With the greatly increased power thus gained there is no increased battery necessary. The power gained is continuous and noiseless, and the cost at a minimum.

We have not followed in detail all the proceedings of the Tariff Commission, which is now holding peripatetic soirees in various sections of the country. So far as we have observed, however, no machinery men have contributed anything to aid the conclusions of the Commission thus far. If machinery manufacturers or workmen have any points to urge in this direction, they would doubtless do well to urge them now.

AMERICAN MACHINIST

PUBLISHED WEEKLY

BY

American Machinist Publishing Co.

HORACE B. MILLER, Prest.

JACKSON BAILEY, Vice-Prest.

LYCURGUS B. MOORE, Treas. and Sec'y

96 Fulton Street, New York.

JACKSON BAILEY, Editor. HORACE B. MILLER, Business Manager.

LEWIS F. LYNE, F. F. HEMENWAY. } Mechanical Engineers.

The American News Company,

Publishers' Agents, New York.

The International News Company,

11 BOUVERIE STREET, (Fleet St.) LONDON, ENG.

Will receive subscriptions for the AMERICAN MACHINIST at 16/8 per annum, postage prepaid.

DEALERS SUPPLIED BY

The American News Company, New York.
The American News Company, Denver, Col.
The American News Company, Kansas City, Mo.
The American News Company, Omaha, Neb.
The American News Company, St. Paul, Minn.
The New York News Company, New York.
The National News Company, New York.
The New England News Company, Boston, Mass
The Central News Company, Philadelphia, Pa.
The Western News Company, Chicago, Ill.
The St. Louis News Co., St. Louis, Mo.
The Cincinnati News Company, Cincinnati, Ohio.
The Detroit News Company, Detroit, Mich.
The Pittsburgh News Co., Pittsburgh, Pa.
The Baltimore News Company, Baltimore, Md.
The Rhode Island News Co., Providence, R. I.
The San Francisco News Co., San Francisco, Cal.
The Brooklyn News Company, Brooklyn, N. Y.
The Williamsburgh News Co., Brooklyn, E. D., N.Y.
The Newark News Company, Newark, N. J.
The Northern News Company, Troy, N. Y.
The Albany News Company, Albany, N. Y.
The Washington News Co., Washington, D. C.
The Montreal News Company, Montreal, Canada.
The Toronto News Co., Toronto, Ontario, Canada.
The Toronto News Co., Clifton Branch, Clifton, Ontario, Canada.

SUBSCRIPTION.

$3.00 a year, in advance, postage prepaid in the United States and Canada.
$4.00 to Foreign Countries, postage prepaid.

ADVERTISING.

Transient, 35c. per line each insertion.
"Business Specials," 50c. a line.

EDITORIAL ANNOUNCEMENTS.

☞ *Positively we will neither publish anything in our reading columns for pay or in consideration of advertising patronage. Those who wish to recommend their wares to our readers can do so as fully as they choose in our advertising columns, but our editorial opinions are not for sale. We give no premiums to secure either subscribers or advertisers.*

☞ *Every correspondent, in order to insure attention should give his full name and address, not for publication, but as a guarantee of good faith.*

☞ *We are not engaged in procuring patent rights, or in selling machinery; nor have we any pet scheme to advance, or hobby to ride.*

☞ *We invite correspondence from practical machinists, engineers, inventors, draughtsmen, and all those especially interested in the occupations we represent, on subjects pertaining to machinery.*

☞ *Subscribers can have the mailing address of their paper changed as often as they desire. Send both old and new addresses. Those who fail to receive their papers promptly will please notify us at once.*

NEW YORK, SEPT. 23, 1882.

CONTENTS.

PAGE

Reed's New High Pressure Sectional Steam Boiler 1
Belts. By Chas. A. Hague 2
New Adjustable Socket Wrench 2
Leatherold 2
Shop Kinks. No. 36, By Lewis F. Lyne 3
The Marine Brake 3
Saunders' Large Pipe Cutting and Threading Machine 4
European Notes—By an American Mechanic 4
New Engine Lathe 5
The Curtis Steam Traps 5
Letters From Practical Men—Compound Engines—An Electro Motor—Making Double-Beat Valves Tight—Copying by Blue Process—Solution for Blue Process Copying—Tool for Brazing Band Saws—Battery of Boilers—"Battery" of Boilers—Filing—Reginald Augustus and His Troubles—A Puzzling Indicator Diagram—Shop Foremen—A Convenient Gauge for Tapers 5, 6, 7
The Pennsylvania Railroad Signaling Apparatus 7
Furnishing Steam for Small Power in New York City 7
Automatic Expansion Gear 7
The Business Situation 8
Steam Engine Construction 8
The Credit System 8
Literary Notes 9
Questions and Answers 9
Manufactures 9
Machinists' and Engineers' Supplies 10
Iron and Metal Review 10

The Business Situation.

Prospects for a good fall business continue in nearly every branch of trade and manufactures. In the regular line of merchandise, a large business is being done at all the centers of trade. Southern and South-western markets and the newer sections of the far West especially, never offered so many fair openings for business as at present. The iron trade is in the least satisfactory condition of any of the manufacturing branches; but it is hoped the labor differences will soon be settled on a basis fairly satisfactory to both employers and employed. Railroad earnings, that great indicator of the state of business, are, taking the country together, fairly favorable, while the certainty of a large increase, as the year's crops begin to move more generally, affords strong assurance that increased activity will be felt all along the industrial line. The latest indications are that foreign countries will absorb less of our surplus breadstuffs and cotton than has been expected, and it is believed that the crops in this country will show greater volume than was for a time counted on. But this need not be regarded as a bad symptom. Lower prices for food products in this country will benefit our vast industrial population, while the increased quantities produced will result in increased business to the transportation interests. The farmer will make up in quantity for any deficiency in the price of what he sells, while improved conditions in merchandise and manufactures will tend to reduce the prices of what he has to buy. Machinery prospects, it is almost needless to add, bid fair to be favorable throughout the year. Taking the whole situation into view, while there is in it nothing about which it is worth while to get excited or over-enthusiastic, there is every reason to expect increased prosperity in the near future. The influx of immigration continues, and advantageously so. It is believed that one hundred dollars is a reasonable average for the amount of money that each immigrant brings into the country, while the great mass of these new-comers begin immediately upon their arrival to be both producers and consumers; functions whose value to existing business interests cannot well be over-estimated. American manufacturers and farmers in supplying a million of newly-landed immigrants with the necessaries of life, ought to be able to get at least as much advantage out of the transaction as if they shipped the same amount of merchandise to Europe for the use of these same people, while the opening up of vast tracts of virgin soil in the far West, and the better and more systematic cultivation of the soil in the older portions of the country, is to the advantage of all and the disadvantage of none.

Steam Engine Construction.

Whether steam engine builders, in any particular line of work, can or cannot learn more than they do learn by studying the successes and the failures of those in other lines than their own, it is certain that there is much in the supposed requirements of steam engine construction for different purposes that is calculated to puzzle the amateur, and that is by no means clearly explained or accounted for by the expert. For instance, the modern stationary steam engine is supposed to require, as nearly as is practicable, absolute rigidity of parts, which, as a matter of course, demands an unyielding foundation and as nearly perfect alignment in erecting as the best skill is able to accomplish. But given all these, together with the utmost refinement of construction, and the results are only good; that is, the stationary engine is far from perfect, so far as its function as a machine is concerned.

On the other hand, the marine engine—particularly the side-wheel steamboat engine—is of necessity the opposite of rigid in construction; sets on an unstable foundation; is never, unless by accident, what the stationary engineer would call approximately in line; is only fair as regards workmanship, and yet on the whole, again speaking of the engine as a machine, its performance is satisfactory; or certainly not less so than the performance of the stationary engine, with all its presumed advantages of construction and arrangement.

It may be said that the steamboat engine, compared with the modern stationary engine, is a slow moving machine, which is quite true; but how is it when the stationary engine is compared with the locomotive engine, which as a machine is confessedly the most successful example of the adaptation of means to an end known in steam engineering?

The locomotive is only a little better as to alignment than the steamboat engine; the work is done with but little of the refinement considered essential in the instance of the stationary engine; the structure possesses but little rigidity, comparatively speaking, and yet whether considered with reference to rotative speed or piston speed, it is essentially a high-speed engine, using high pressure steam.

Again, it may be said that in each instance cited the special requirements demand special construction to meet them, which to a certain extent may be granted, but hardly to the extent that will explain all of seeming contradiction there is in a consideration of the three types of engines. After all, they are either of them neither more nor less than a steam engine, and together have much more in common than is special to either.

If the steamboat engine performs satisfactorily, by comparison roughly made, out of line and lacking stability and rigidity, may there not be something that brings about its satisfactory working worth the attention of stationary engine builders, beside slow rotative and moderate piston speed?

But particularly with the acknowledged success of the locomotive engine, working under many of the disadvantages of the steamboat engine, with the additional disadvantage of dust and dirt, making altogether conditions that would not be entertained in the case of the stationary engine, there must be reasons why it works with such a degree of satisfaction at a speed seldom reached in other steam-engine practice, and these reasons must, to some extent at least, be universally applicable in steam engineering.

If slow speed accounts for the possibility of working the steamboat engine, what explains the satisfactory working of the locomotive engine at high speed—a speed that few stationary engine-builders are anxious to rival, with the most solid construction and arrangement?

There is much in steam-engine practice that seems anomalous, if the steam engine is looked at simply as a machine for doing work, which if it is looked at as a machine in which steam is used, is plainer.

Perhaps the builders of other classes of engines would be profited, sometimes, by looking at the steamboat engine, but more particularly by looking at the locomotive engine from this point of view.

The Credit System.

That a man's worst enemy may be the man who is readiest to grant him favors sounds paradoxical, but nevertheless it is often true. Of its truth no better example need be looked for than in the case of individuals or firms who allow themselves to be cajoled into accepting more credit, in the way of purchases, than is good for them. Nor need anything in this view militate against the wisdom or expediency of using a moderate credit in a moderate way; but the difficulty is, mere character is often given too much weight in establishing credit. That a man, whose character for uprightness indicates him as a man who can be trusted in a monetary way, is a better or safer debtor than one of a different class, no one will dispute. But uprightness of character alone will not make two dollars of assets pay three dollars of debts. And the man or firm who leaves the uncertainties of life and the fallibilities of judgment out of the account in making debts, too often comes to a realizing sense of the impossibility of just that thing.

In the old days, before railroads were introduced, before the telegraph or telephone was thought of, when daily papers were few or feeble, and when the machinery of exchange, as well as the machinery of thought, existed in an embroyo condition or not at all, credit within certain limits was in great measure a necessity. Many a man of good character, good ability and sound judgment was in those days, by the wise use of credit, enabled to establish a business, which would have been impossible upon his own unaided means, and many are still doing it. But the changed conditions under which we live too often render such aid more grateful to the imagination than healthy for the purse.

When a man boasts that he can have all the credit he wants, he hoists a danger signal. To have ample credit and use little of it, is to be the owner of a species of property, which is not employed and cannot be transferred, and which is, therefore, not greatly worth having in itself. To have credit and use it all, too often turns the man who might otherwise own himself, into a chattel whom somebody else owns. To build for one's self is one thing; to build nominally for one's self, but really for another, is quite a different thing. To enter into pecuniary obligations on the strength of future wages, or future business, or future crops, involves the certainty of obligation equally with the uncertainty of risk, and is almost tantamount to playing with the dice loaded against the player.

That in certain sections of this country the credit system still prevails as it at one time prevailed in nearly every section, is a lamentable fact, and it is none the less lamentable because those sections show remarkable signs of advancing prosperity. Prosperity in itself is often only relative, and by no means indicates what might have been, or what might be, with the whole community living and paying in the present, and not borrowing for or discounting the future.

In a recent issue, the *Railway Age* suggests the desirability of the establishment by the United States of a bureau for the collection of railway information and statistics, under a law requiring that reports shall be correct, and shall be rendered on the same day of the year. That such a suggestion should be made by a prominent railway journal is significant of a growing feeling among railway men, that a more strict and uniform standard of accountability on the part of railroad directors and officers will inure to the benefit, not only of railroads, but of the general public. At present, railroad statistics are furnished or not furnished, as the self-interest of officials may require. When furnished, very imperfect standards prevail, and the dates are as various as the days in the year, rendering symmetrical analysis and compilations impossible. The opportunities for secrecy which the present system affords dishonest managers tend to keep investments out of railways. This in turn operates to defeat the aims of honest railroad managers, and plays wholly fast and loose with the interests of the people.

In the AMERICAN MACHINIST of August 26, 1882, a pinch bar with an inserted steel heel was illustrated and described by Lewis F. Lyne, as having been made and used by him some six years ago. Mr. Lyne stated that to the best of his knowledge there was no patent in the way of the free use of this bar. Since then we have received a communication, with copy of patent inclosed, which proves conclusively that the writer of the communication, Abram V. Berry, of Jackson, Mich., patented in 1874 the application of an angular piece of steel, for a fulcrum to the heel of a pinch bar. The angles of the fulcrum, to quote from Mr. Barry's specification, "may be either obtuse, rectangular, or acute."

Frederic H. Morse, who recently died at Oxford, Maine, in the 33d year of his age, was a studious and able mechanic and one who will be missed by those who knew him well, not only as a mechanic, but as a genial

and generous friend. He early elected to become a machinist, and began this career at the age of 17, following it, with the exception of a brief interval spent at a commercial college, until within a short time of his death. At the time when compelled by sickness to leave off his work, he was foreman for the Whittier Machine Company, of Boston, Mass., which responsible position he had held for two years. Mr. Morse had given much thought to the subject of narrow-gauge railroads, his articles on that subject in the AMERICAN MACHINIST showing him to be entirely familiar with the statistics relating to it.

A. J. Shaw, formerly of Gross, Shaw & Co., Auburn, Me., and an occasional contributor to the AMERICAN MACHINIST, takes hold on September 1st as Superintendent for Robert Gardner & Son, Montreal, Canada, steam engine builders and general machinists.

According to the *English Mechanic*, a new dynamo-electric machine, patented by Lord Elphinstone and Mr. C. W. Vincent, of the Royal Institution, is attracting some attention. As the patent is not yet complete, full details cannot be published; but the machine is based on the discovery that the nearer the approach to a closed circuit the stronger becomes the field, and the longer the iron retains its magnetism. Experiments are being made on a large scale.

We judge, from the number and average length of the communications (some far too voluminous for our columns) which we are receiving in reference to the troubles of Reginald Augustus Hunt, as narrated by himself in a recent issue, that that estimable young man is going to have difficulty in meeting all his views, in the matter of foremen. We fancy, before he is through, he will have to settle down upon the plan of running his shop simply to make money. If the original Wyckoff ever meets with reverses, and, instead of running a shop of his own, wants to take a job as foreman, Reginald's shop at Wyckoffville may, perhaps, be the very place at which he would do well to apply. But that contingency seeming unlikely, as Wyckoff, with all his peculiarities, usually contrives to get on, probably the next best thing that Reginald could do would be to induce Chordal to break through the trammels of professional work, and jot down some points for Reginald to think of.

Literary Notes.

DIRECTORY TO THE IRON AND STEEL WORKS OF THE UNITED STATES. EMBRACING BLAST FURNACES, ROLLING MILLS, STEEL WORKS, FORGES AND BLOOMARIES IN EVERY STATE AND TERRITORY. Prepared and published by the American Iron and Steel Association. James M. Swank, Secretary, 261 South Fourth Street, Philadelphia, Pa. Price, $3.00 per copy.

This is the sixth edition of this directory that has been issued since 1873. This edition has been thoroughly revised and corrected up to July 25, 1882. The rapid growth and changes in the ownership of steel works in this country render the preparation of such a work as this very difficult and laborious.

An important and noticeable feature of this new edition is a full numerical index to the names of all the iron and steel works of the United States. The alphabetical arrangement by States of the descriptions of the various iron and steel works, which has characterized the former editions, has been continued in this edition. A complete summary of the number and capacity of the iron and steel works described in this, the sixth edition, is compared with the summary published in the fifth edition, which was corrected to March 1, 1880.

The statistics show that the capacity of all the furnaces from March, 1880, to July, 1882, had increased from 6,500,000 net tons in 1880, to 8,000,000 net tons in 1882, which is largely due to improvement in furnace construction and management.

QUESTIONS & ANSWERS.

Under this head we propose to answer questions sent us, pertaining to our specialty, correctly, and according to common sense methods.

(320) J. B. F., Hamilton, O., asks: What is the best process for welding malleable iron to steel? *A.*— We are not acquainted with any successful process for doing this.

(321) J. W. G., Allegheny, Pa., writes: I have had an argument with a friend, who claims that the English steamers to New York have high-pressure non-condensing engines. I claim their engines are low-pressure condensing. Which is right? *A.*—The engines are condensing, but many of them use high-pressure steam.

(322) H. P., Bangor, Me., asks: Please tell me what will make new iron tea-kettles fit for use; that is, what will take the bad taste from the water boiled in them? *A.*—Use for a short time will coat the inside, and so far as we know is the only effectual remedy. We should suggest to keep water boiling in the kettle for a day or two, changing it occasionally.

(323) Ignorance, Chicago, Ill., asks: Will you please publish the standard pitch for the threads of gas pipe? *A.*—

Diameter in inches.	No. of threads per inch.	Diameter in inches.	No. of threads per inch.
⅛	27	1	11½
¼	18	1¼	11½
⅜	18	1½	11½
½	14	2	11½
¾	14	2½ and up.	8

(324) W. B. Cincinnati, Ohio, asks: What will prevent the water from a spring coming through the sides of a cemented cistern? *A.*—There will be a pressure against the sides and bottom of the cistern in proportion to the height the water from the spring would rise. In building a cistern in wet ground great care must be taken in the construction to keep water from finding its way in. You can try the plan of pumping the water all out of the cistern, mixing Portland cement thin and applying it freely to the inside with a brush. The best time to do this is when the ground is quite dry, if possible at a time when the spring is so low that the water will not run into the cistern. If you cannot stop the inflowing water in this way, we know of nothing you can do except to rebuild the cistern, making it stronger.

(325) J. T., Marshall, Tex., writes: I have made a 12-inch lathe for turning wood, with three change speed. The cone diameters on spindle are 8", 6¼" and 4½". The diameters on driving wheel are 32", 30¼" and 28½"; distance between centers 28". When the belt is on fast speed it is right, but when changed to slow speed it is too loose. 1. How must I change the large wheel to make it right? *A.*—See article "Cone Pulley Diameters," in the AMERICAN MACHINIST of Feb. 25, 1882. 2. Is the driving wheel too large? *A.*—We should say it was about right. 3. Last year you published an article on foot lathes. Can I get the number containing this article, and if so, what is the date? *A.*—You can get the number. The date is March 26, 1881.

(326) O. P. S., New Britain, Conn., asks: 1. Is it a good plan to blow off water from a boiler to prevent foaming, when the pressure is as high as 60 lbs.? *A.*—If you mean to blow off a little water, it is sometimes a good plan; if you mean to blow off all the water, we should say no. 2. Can the pressure become so great as to rupture a boiler before it is indicated on a steam gauge 10 feet away? *A.*—The gauge, if properly connected, will indicate any rise of pressure in the boiler, practically, as soon as it occurs. 3. Does the pointer on all gauges vibrate when the engine is in motion; I mean by this does the engine use more steam than the boiler can supply? *A.*—Usually the pointer vibrates more or less, which is caused partly by a slight reduction of pressure in the boiler or steam pipe, and partly by the current of the steam. In a boiler making steam enough to keep up the pressure, this loss is recovered during the time steam is cut off from the cylinder.

(327) W. T., Brooklyn, N. Y., writes: I am a boy 17 years old, and am at present working at brass finishing. I am pretty well acquainted with the horizontal and vertical engine, and am making a small model of a steam engine. I study the drawings of everything in the AMERICAN MACHINIST until I understand them. What I want is to become an engineer, but I don't know how to do it. Can you help me? Can I learn it at school? *A.*—You must learn to run and care for a steam engine just as you learn brass finishing; that is, by working at the business. As you expect to gain something by becoming an engineer, you must expect to sacrifice something to become one. You cannot gain the knowledge you require at any school. You should try and get work in some capacity around engines and boilers at the best pay you can get, and by close attention learn all you can of the duties of an engineer, in the meantime improving yourself by reading and study.

(328) E. F., Etchemin, P. Q., writes: We are troubled by sparks from our chimney, and I think the cause is faulty construction of the brickwork. From the raise above the grate bars [the bridge wall] the brickwork is carried horizontally along until it strikes the back wall, there being no chamber to receive the ashes or sparks which are liable to accumulate in the combustion chamber. The chimney is of iron 100 feet high. The boilers are circular tubular, and the fuel is mill refuse, such as chips, shavings, etc. As we are going to put in another boiler, please let me know what we can do to stop the nuisance. *A.* Your trouble is undoubtedly, as you suggest, largely due to lack of sufficient combustion chamber behind the bridge wall. Change your setting, so as to leave from 3 to 3½ feet (according to size of boiler) below the bottom of shell in the run to the back wall. If your boilers are long you can slope the bottom of the run from the bridge wall to the back wall, leaving say, 3½ feet at the bridge wall and 2 feet at the back end. This not only makes a combustion chamber, affording time for combustion, but it gives the heavy particles time to settle. Provide convenient doors for cleaning out this chamber.

(329) W. J. W., Philadelphia, Pa., asks: If an indicator card is taken from the blowing cylinder of a blast engine, what will be the difference between its form and the form of a card taken from the steam cylinder? *A.* This will depend upon the conditions under which the two cylinders are working. Generally speaking the two cards will bear some resemblance, if you consider one of them reversed, end for end; for instance, the lower line of the card from the blowing cylinder will be drawn when that cylinder is getting air, and will be a little below the atmosphere. When the piston begins its motion in the opposite direction it will compress this air up to whatever pressure it delivers at, before the delivery valves open; this compression line if the pressure of air against which it delivers is considerable, having the appearance of the expansion line of the steam cylinder card. After the delivery valves open, the line will resemble to some extent the steam line of the card from the steam cylinder, and finally before the admission valves open, the line will correspond to the compression line of the steam cylinder.

BUSINESS SPECIALS.

Transient Advertisements, 50 cts. a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Thursday morning for the ensuing week's issue.

F. Samuelson, Pattern Maker, 38 Gold St., N. Y.

James W. See, Consulting Engineer, Hamilton, O.

Steel Name Stamps, &c. J. B. Roney, Lynn, Mass.

Portable Forges, $10. Holt M'f'g Co., Cleveland, O.

Presses & Dies. Ferracute Mach. Co., Bridgeton, N.J.

Hoerle Bros., Naugatuck, Conn. Small Dies and Special Tools to order.

J. C. Hoadley, Engineer and Expert, 29 High St., cor. Federal, Boston, Mass.

Howard S. Abbot, Solicitor of Patents, 617 7th St., opposite the Patent Office, Washington, D.C.

R. Dudgeon, 24 Columbia st., New York, Improved Hydraulic Jacks and Roller Tube Expanders.

Latest and best books on Steam Engineering. Send stamp for Catalogue. F. Keppy, Bridgeport, Ct.

Foot Power Machinery, for workshop use, sent on trial if desired. W. F. & John Barnes, Rockford, Ill.

"Steam Economy," 124 pp., cloth, $1.00 (illustrated), points out remedies for defects in engines. Best indicator practice. A. Wilkinson, 123 n. 4th St. Phila.

Mechanical Engineering.—To learn inventing, designing and construction of machinery at school. Address, S. W. Robinson, Ohio State University, Columbus, O.

For Sale—Large Brick Foundry and Machine shops. Do good business, growing city and country, and only shop. Poor health, reason for selling. Address J. P. Dennis & Co., Sioux City, Iowa.

"How to Keep Boilers Clean," and other useful information for steam users and engineers. Book sent free by the publisher, Jas. F. Hotchkiss, 84 John street, New York. Mention this paper.

We will pay 25 cents each for copies of the AMERICAN MACHINIST for January 1, 1881, which are clean and in condition for binding. American Machinist Publishing Co., 96 Fulton street, New York.

For Sale—Complete file of Engineering (except several early issues out of print), six volumes bound, remainder unbound. In perfect condition. Address X, Box 2714, New York City.

Russell & Struthers, Wax Process for making outline engravings. Specimens each week in the AMERICAN MACHINIST. We also do Map Engraving with best facilities. Russell & Struthers, 59 Park Place, New York.

Bound Volumes and Patent Binders. We can furnish Volume 3 of the AMERICAN MACHINIST, containing the full 52 issues of 1880, or Volume 4, containing the 53 issues of 1881, neatly bound in cloth, ready to ship by express, for four dollars. Either volume unbound, three dollars. "Patent Binder" for the AMERICAN MACHINIST holds 53 weekly issues in good shape. Sent to any address by mail for one dollar. AMERICAN MACHINIST PUBLISHING CO., 96 Fulton Street, New York.

"Extracts from Chordal's Letters," the most interesting mechanical book published. A great variety of mechanical and business topics treated in a wise and witty way that will be instructive to old and young mechanics, and interesting to everybody. As many as 150 copies have been sold in a single shop. Over 40 humorous illustrations; 320 pages, 12mo. Price, $1.50 per copy, by mail, to any address. AMERICAN MACHINIST PUBLISHING CO., 96 Fulton St., New York.

Rocks, Minerals and Stocks; by Frederick H. Smith, Consulting Engineer and Geologist. Contents: Part I. World Building, Prime Minerals and Rocks, the Formation; Part II. Gold and Silver, Industrial Metals, Coal and Oil, Industrial Minerals, Precious Stones; Part III. Stock Companies, Stock Dealing, Stock Tricks. *A vade mecum* for the use of everyone interested in these important topics. Scientifically accurate, witty, fascinating. *Sui generis* among technical books. Handsomely bound in cloth, $1.50, in paper, 75 cents. Order through your bookseller, or address The Railway Review, 182-184 Dearborn St., Chicago, Ill.

MANUFACTURES.

The Swift M'f'g Co. have commenced the erection of a new cotton mill in Columbus, Ga.

Armington & Sims, Providence, R. I., have orders on hand for 116 steam engines.

A company has been formed at Denver, Col., for the purpose of erecting a mill to manufacture paper.

The Lambert & Bishop Wire Fence Company of Joliet, Ill., has been incorporated with a capital of $300,000.

The Cotton Improvement Company propose to establish at Hogansville, Ga., a model cotton ginnery with a capacity of 35 bales per day.

McCallum, Crease & Sloan are to erect a new carpet factory in Philadelphia, on Germantown Ave., near the Wayne Junction.

There are 43 furnaces, rolling mills, steel works, forges and bloomaries in Tennessee, employing 4,095 hands and $3,681,776 capital.

A stock company is being organized at Birmingham, Ala., for the purpose of constructing and operating a large stove foundry.

The Vulcan Iron Works, Toledo, Ohio, are building a new boiler shop 100x80 feet which they will fit up with improved machinery, including a power riveter.

It is anticipated that the new locomotive works at Garfield, Ill., will be completed in about four months. The buildings will cost upwards of $100,000.

The old factory property at Scottsville, Ala., having been purchased by capitalists, the mills will be rebuilt and connected by a railway with a trunk line of railroad,

Wallingford, Conn., has raised the necessary $100,000 to induce the Wilson Sewing Machine Company, of Chicago, to locate there. The capital of the Company is to be $300,000.

The Curtis Regulator Company, 59 Beverly Street, Boston, Mass., write us that the demand for their steam traps is now so great that they are pushed to their utmost to fill orders.

The Cape Cod Glass Works at Sandwich, Mass., have been sold to Mr. Charles W. Spurr of Boston, who, without delay intends to adapt the property to a factory for the manufacture of wood hangings. The works have been idle since 1869.

New additions are being made to the Malleable Iron Works, at Youngstown, Ohio. The largest addition is to be 230x75 feet in dimensions, and is to be used as a foundry. The others are to be 70x25 and 40x30 feet respectively.

Augustus Hardy & Co. have purchased the large factory of N. C. Sanger & Son, Watertown, Mass., and begun to refit it and put in new machinery for the manufacture of doors, sashes and blinds, on an extensive scale.

A large manufactory for making compressed paper-wheels with steel tires, for railroad purposes, will shortly be built on a lot now being negotiated for near Third and Berks streets, Philadelphia. Prominent railroad men comprise the company.

Something said to be new in cotton industry is the product of the Hopedale Mills at Augusta, Ga. The raw material used in these mills is the waste gathered from other mills. Threads and twine made from this waste, it is claimed, are equal in quality to those made from new stock.

In addition to the foundry built by the Baker's Falls Iron and Brass Works, now in operation, the company are building a machine shop which will be hurried to completion, and put in use at an early date. A large number of men are employed, and the proprietors expect soon to have occupancy of their enlarged facilities.—*Sandy Hill (N. Y.) Herald.*

Thomson, Sterne & Co., (Crown Iron Works) of Glasgow, Scotland and London, England, have purchased extensive works at Manchester, England, for the manufacture of the Clerk Gas Engines and Strong's patent Feed Water Heaters and Purifiers. The new works will be run additional to their other business.

As an instance of the steady industrial developments going on in the Southern States, a single issue of a railway journal chronicles the opening in West Virginia of four short railroads owned by private parties and intended to connect coal and iron deposits owned by them with the Chesapeake and Ohio Railroad.

The Ohio Central Coal Company, a coal mining corporation, whose stock is owned by the Ohio Central Railroad Company, is about purchasing $70,000 worth of additional coal lands near Corning, Ohio. This Company already owns about 12,000 acres of coal lands in that neighborhood as well as a large tract near Charleston, W. Va., to which the road is being extended from Corning, the present working terminus.

According to a correspondent of the Augusta, (Maine) *Chronicle* a cotton picker that will do the work of twenty men will be put into use this fall. The machine is manufactured by The Carver Cotton Gin Company, East Bridgewater, Mass. The principle upon which this machine works is the production of a partial vacuum in a hose by means of a suction fan, the cotton being drawn into the hose as it is pointed towards the open bolls.

Machinists' and Engineers' Supplies.

NEW YORK, Sept. 7, 1882.

There are unmistakable evidences this week of a slight increase of business in supplies which indicate that the fall trade has begun. Every one appears to anticipate a prosperous condition of things. Prices are firm but there are no changes in prices worthy of note.

Iron and Metal Review.

The prices of Pig Iron continue firm and the tone of the market satisfactory, still the consumers do not seem to feel inclined to purchase any more than is required for their immediate wants. We quote prices in favor of the buyer as follows: Foundry, No. 1, $26 to $26.50; Foundry, No. 2 X, $23.50 to $24.50; GreyForge, $20.50 to $21.50. The Foreign market continues quiet with prices slightly weaker than last reported. We quote as follows: Coltness, $26 to $26.50; Glengarnock, $24 to $24.50; Gartsherrie, $25.50 to $26; Summerlee, $25.50 to $26; Carnbroe, $24; Eglinton, $23 to $23.50; Langloan, $25.50 to $26 Scrap and old rails same as last reported. Bar iron is in slow demand at 2.50c. for large lots. Copper is in slow demand at 18¼c. to 18¾c.; Banca Tin, 28c; Straits and Malacca 25⅛c. to 25⅝c.; Billiton, 24⅜c. to 24¾c.; Australian, 25c. to 25⅛c. Lead, Common, 5¼c.; Refined, 5.05c. Antimony, Hallett's 11c.; Cookson's, 13c.; Nevada, 12½c.

WANTED

"Situation and Help" Advertisements, 30 cents for each seven words (one line) each insertion. Copy should be sent to reach us not later than Thursday morning for the ensuing week's issue.

Wanted—Situation as Engineer by competent engineer and machinist. Address D, this office.

Wanted engagement by mechanical draughtsman and machinist technically educated. Address P. O. Box, 352, Hamilton, Ohio.

Wanted—A first-class tool maker on milling tools and fixtures. Dueber Watch Case Manufacturing Company, Cincinnati, Ohio.

Foreman wanted to take charge of our Press and Die Departments. Address, stating experience, etc., Niagara Stamping and Tool Co., Buffalo, N. Y.

Experienced Mechanical Engineer and Draughtsman who has designed and superintended, is open to engagement. Address S, 367 Nostrand Avenue, Brooklyn, N. Y.

Wanted—Immediately, superintendent for a manufactory and machine shop. Familiar with sugar machinery and general machine work. Address C. H., care AMERICAN MACHINIST.

Wanted—By a mechanical engineer of means and standing, a position as superintendent, where duties are not laborious physically, or would take an interest financially in a small thriving concern. Address X, Box 2214, New York City.

Instructor wanted in the Montclair, N. J., Public School; must have some idea of mechanical drawing, and tact in imparting general knowledge in wood and iron working to the young. Address, or apply to, Sam'l Crump, Montclair, N. J.

Wanted—A good, sober, general machinist, or a practical foundryman with $3,000 capital, to take half interest in machine shop and foundry. Shop and tools new and doing a good business in a city of 10,000 inhabitants. Address, Box 2292, Ottawa, Ill.

A competent mechanical draughtsman desires a position. Technically educated; genuine experience in machine and pattern shop; familiar with the designing of engines, gearing, steam hammers, special tools and general shop and foundry work. Reliable working drawings, plans, blue prints, etc. Address, stating compensation, "Draughtsman," No. 10 N. High street, Columbus, O.

An experienced mechanical engineer now superintending and designing machinery for one of the largest companies in the United States, wants a position to travel for one or two first-class houses among railroads and manufacturers. Has an extensive acquaintance, having been for some years agent for a leading manufacturer of railway and machinists' tools. Character and references beyond question. Address, Traveller, AMERICAN MACHINIST Office.

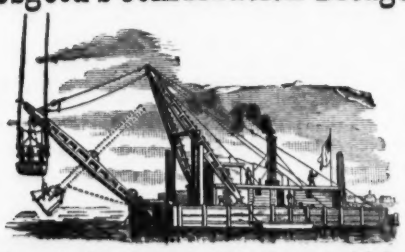
For Sale! One 80 H P. Root's Sectional Safety Boiler. J. A. Fay & Co., Cincinnati, Ohio.

For Sale-A Richards Indicator with three springs, new and complete. Address Indicator, Box 2, office AMERICAN MACHINIST.

A machinery manufacturing firm desires to buy gear and pulley patterns (stock patterns) either new or second-hand. Address, stating condition and prices, Patterns, care AMERICAN MACHINIST.

ITALIC LETTERING
FOR DRAUCHTSMEN.
One sheet blue, printed and mounted, with instructions, 30 cts. or 4 sheets for $1.00.
Address, **WILLIAM A. LORENZ,**
55 Garden Street, Hartford, Conn.

Osgood's Combination Dredge.



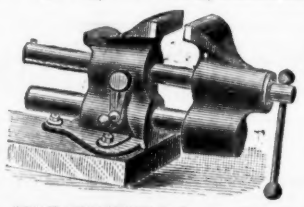
Guaranteed to excavate 50% more material from hard bottom than any other machine. Circulars, comparative strain sheets, &c., furnished.
OSGOOD & MACNAUGHTON, Albany, N. Y., successors to **Ralph R. Osgood, Troy N Y.**

The Second Grand Exhibition Fair
OF THE
New England Manufacturers' and Mechanics' Institute
Will be held in THEIR MAMMOTH EXHIBITION BUILDING, (the Largest in the United States),
In Boston during the months of September & October, 1882.
Affording the best opportunity for advertising, or of introducing to the public new inventions. Artists, Inventors, Producers, Mechanics and Manufacturers, from every nation, invited to contribute. The product of New England's hand and brain will be well represented. No charge for space. Blank forms for application to exhibit furnished free, upon application to
JOHN F. WOOD, Treas.,
38 Hawley Street, BOSTON, MASS.

COOKE & CO., FORMERLY COOKE & BEGGS,
Dealers in MACHINERY AND SUPPLIES.
6 Cortlandt Street, New York.
AGENTS FOR
The Waters Perfect Governor,
Having Adjustable Speed, Automatic Safety Stop, Sawyer's Lever, and Solid Composition Valves and Seats.

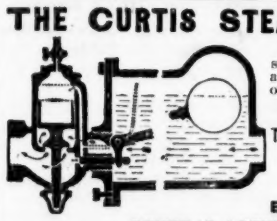
ALSO,
SUPPLIES
For Machinists, Railways, Mills, Mines, &c.
Please send for circular and state that you saw the advertisement in this paper.

New Quick-Adjusting, Screw-Clamp, Parallel Bench Vise.
Parts interchangeable. Steel Shafts, Screw and handle.



A strictly first-class machine tool. Compact, rigid, strong, convenient
Address, **JOHN THOMSON, 9 Spruce St., N. Y. City**

THE CURTIS STEAM TRAP.

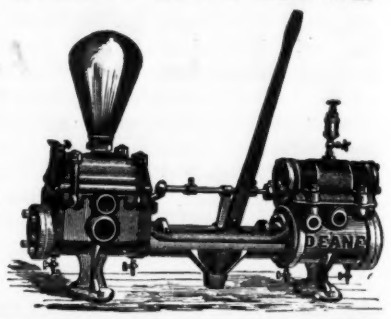


Send for Circular stating advantages and superiority over other traps.
Manufactured by
THE CURTIS REGULATOR CO.
51 Beverly St.
BOSTON, MASS.
GENERAL AGENTS:
A. ALLER, New York, 109 Liberty St.
JOHN McKAY, JR., Philada., 135 North 3d St.
EDW'D J. MOORE, Baltimore, 8 South St.

JENKINS PATENT VALVES
THE STANDARD
MANUFACTURED OF BEST STEAM METAL.
JENKINS BROS. 71 JOHN ST. N.Y.

JEROME B. SECOR,
MANUFACTURER OF
Machinery and Tools,
IMPROVED WIRE FEED SCREW MACHINES, GUN AND SEWING MACHINE TOOLS, DIES FOR DRAWING, FORGING, BLANKING, &c., MADE TO ORDER.
Manufacturer of
THE SECOR SEWING MACHINE,
Factory Cor. Broad & Railroad Ave.
BRIDGEPORT, CONN.

"THE DEANE" STEAM PUMPS FOR EVERY SERVICE.

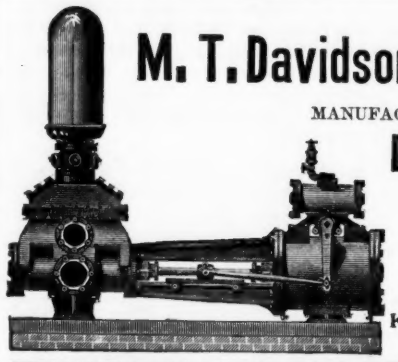


Send for New Illustrated Catalogue.
:o:
The Deane Steam Pump Co.
HOLYOKE, MASS.
92 & 94 Liberty St., New York. 54 Oliver St. Boston. 226 & 228 Lake St., Chicago.

Grey Iron Castings
Of superior quality for machinery and other purposes. Delivered promptly in New York. Estimates given. Castings finished when required.
Sedgwick & Stuart Mfg. Co.
POUGHKEEPSIE, N. Y.

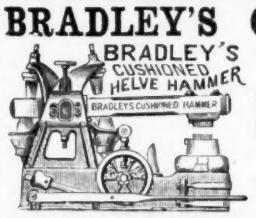
ENGINEERS' and MACHINISTS' DRAWING-BOOK.
A Complete Course of Instruction for the Practical Engineer, comprising Linear Drawing, Projection, Eccentric Curves, the various forms of Gearing, Reciprocating Machinery, Sketching and Drawing from machines, Projection of Shadows, Tinting and Coloring and Perspectives. Price $10, half morocco. Send 10c. for 112 page catalogue.
D. VAN NOSTRAND, 23 Murray & 27 Warren Sts., N Y.

THE
M. T. Davidson Improved Steam Pump,
MANUFACTURED BY
Davidson Steam Pump Co.,
OFFICE & WORKS:
41 to 47 KEAP STREET, BROOKLYN, N. Y.



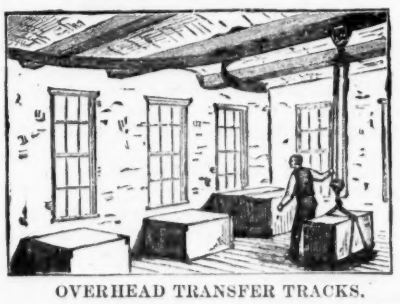
Warranted the Best Pump made for all Situations.
KELLY & LUDWIG, Agents, 49 and 51 North 7th St., Phila., 97 Liberty Street., New York.

BRADLEY'S CUSHIONED HELVE HAMMER.



Awarded first premium, Silver Medal at American Institute Fair, 1873, Cincinnati Industrial Exposition, 1874, and the Diploma of Honor and Grand Medal of Merit at the Centennial Exhibition, in 1876,
Being the highest award given any goods of their class in America or Europe.
IT HAS MORE GOOD POINTS, LESS COMPLICATION,
MORE ADAPTABILITY, LARGER CAPACITY,
DOES MORE AND BETTER WORK, TAKES LESS POWER,
COSTS LESS FOR REPAIRS,
THAN ANY HAMMER IN THE WORLD.
Guaranteed as represented. (Established 1832.)
BRADLEY & COMPANY, Syracuse, N. Y.

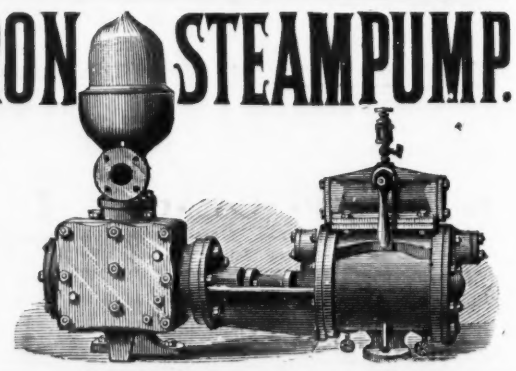
OVERHEAD TRACKS
WITH WESTON'S DIFFERENTIAL PULLEY BLOCKS.



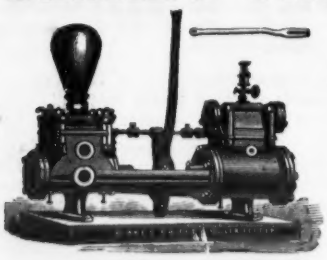
OVERHEAD TRANSFER TRACKS.

ANY CAPACITY.
The Weston Pulley Block is suspended from a traveler or trolley which runs freely on the lower flange of the track. The tracks by means of curves and switches can reach any desired points.
Plans and estimates furnished on application.
SOLE MAKERS,
THE YALE LOCK MFG. CO.,
Manufacturers, Engineers and Machinists,
Principal Office & Works, STAMFORD, Conn.
SALESROOMS:
NEW YORK, 53 CHAMBERS ST. | **BOSTON,** 224 FRANKLIN ST. | **PHILADELPHIA,** 507 MARKET ST. | **CHICAGO,** 64 LAKE ST.
40 Page Illustrated Catalogue of Light Hoisting Machinery sent on application.

THE CAMERON STEAMPUMP.
Is the Standard of Excellence
AT HOME AND ABROAD.
THE A. S. CAMERON
STEAM PUMP WORKS,
Foot of East 23d Street, New York.



BLAKE'S PATENT STEAM PUMPS.



MORE THAN 13,000 IN USE.
Adapted to Every Situation.
Send for New Illustrated Catalogue.
GEO. F. BLAKE MANF'G CO.
88 Liberty Street, **NEW YORK.** | *44 Washington St.,* **BOSTON.**

BETTS MACHINE CO.
WILMINGTON, DEL.
Manufacturers of
MACHINE TOOLS
OF ALL KINDS.

NICHOLSON FILE CO.,

SOLE MANUFACTURERS OF

FILES AND RASPS

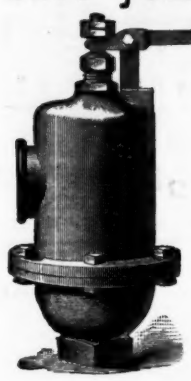
HAVING THE INCREMENT CUT.

Also, FILERS' TOOLS and SPECIALTIES,

"Nicholson File Co's" Files and Rasps.
"Double Ender" Saw Files. File Brushes, File Cards.
"Slim" Saw Files. Surface File Holders.
"Racer" Horse Rasps. Vise File Holders.
Handled Rifflers. Stub Files and Holders.
Machinists' Scrapers. Improved Butchers' Steels.

Manufactory and Offices at PROVIDENCE, R. I., U. S. A.

Save your Boilers FROM DANGER OF Overpressure!



THE CONSOLIDATED
SAFETY-VALVE COMPANY,
CAPITAL, - - $100,000.00.

CHARLES A. MOORE, Pres. and Gen. Manager. MARTIN LUSCOMB, Sec'y and Treas. GEORGE W. RICHARDSON, Superintendent.

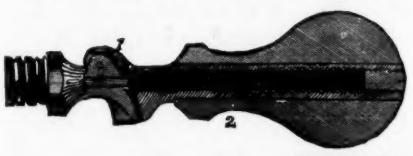
SOLE MANUFACTURERS OF THE **ONLY**

Patent Nickel-Seated "Pop" Safety Valve.

The Only Perfect Safety-Valve made. Approved by the U. S. Board of Supervising Inspectors. For Stationary, Locomotive, Marine, and Portable Steam Boilers.
Our Patents cover all Safety-Valves utilizing the recoil action of steam, and familiarly known as "Pop" Safety-Valve. ☞ Purchasers beware of infringements of our patents. SEND FOR DESCRIPTIVE CIRCULAR.

Salesrooms, 111 Liberty St., New York.
Manufactory, 51 & 53 Sudbury St., Boston.

THE BEST BALL GAUGE COCK IN THE MARKET.



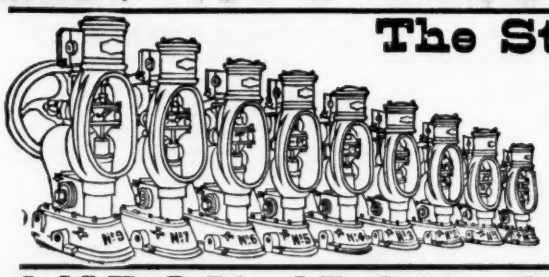
Each Gauge Cock has four inches of Jenkins' Packing. One packing will last several years.

A LARGE STOCK CONSTANTLY ON HAND.

E. G. FELTHOUSEN,
MANUFACTURER OF
HAND and AUTOMATIC CYLINDER OIL PUMPS, RATCHET DRILLS,
FLUE CLEANERS, &c., &c.

SALESROOMS, - 59 AND 61 MAIN STREET,
FACTORY, - 72 TO 80 WASHINGTON STREET, } BUFFALO, N. Y.

The Steam Pumps



Made by VALLEY MACHINE CO., Easthampton, Mass., are the Best in the World for Boiler Feeding and other purposes.

AKRON IRON COMPANY,

AKRON, O.

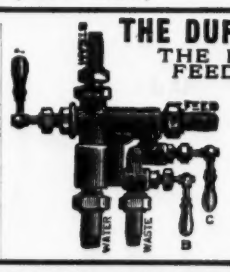
PATENT HOT POLISHED SHAFTING.

Superior to any shafting in market for the following reasons, viz.: 1st.—It is perfectly straight and round. 2d.—It can be rolled accurately to any desired gauge. 3d.—It has the beautiful blue finish of Russia Sheet Iron, rendering it less liable to rust or tarnish than shafting of the ordinary finish. 4th.—It will NOT SPRING or WARP IN KEY SEATING like most of the other manufactured shafting sold in the market, and, as a consequence, is admirably adapted for LINE AND COUNTER SHAFTING. 5th.—The surface is composed of MAGNETIC OXIDE OF IRON, forming a superior journal or bearing surface. 6th.—It is made of superior stock.
Sizes made from 7/8 to 3 1/16 inches, advancing by sixteenths. Price lists, with references and other information, furnished on application to

AKRON IRON CO., Akron, O., Sole Manuf'rs,
Or **E. P. BULLARD, 14 Dey Street, New York,** General Eastern Agent.

DRAWING INSTRUMENTS
AND MATERIAL, PAPER, &C.
G. S. WOOLMAN,
116 Fulton Street, New York.
Fully priced and illustrated Catalogues.

W. C. YOUNG & CO., Worcester, Mass.
Manufacturers of
ENGINE LATHES, HAND LATHES,
Foot Power Lathes, Slide Rests, &c.

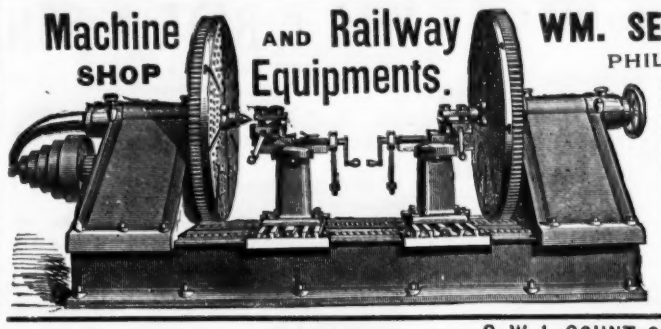


THE DUPLEX INJECTOR.
THE BEST BOILER FEEDER KNOWN.
Not liable to get out of order. Will lift water 25 feet. Always delivers water *hot* to the boiler. Will start when it is hot Will feed water through a heater. Manufactured and for sale by JAMES JENKS, Detroit, Mich.

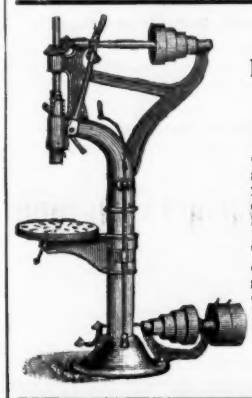
TEWKSBURY AUTOMATIC ELEVATOR CO.

MANUFACTURERS OF
PACKAGE AND LIGHT FREIGHT
ELEVATORS,
60 Temple Court, Beekman Street,
Send for Circulars. NEW YORK.

Machine SHOP AND Railway Equipments.



WM. SELLERS & CO.
PHILADELPHIA.
Shafts, Couplings, Hangers, Pulleys, Mill Gearing, etc., Lathes, Planers, Drills, Shapers, Bolt Cutters, Twedell's Hydraulic Riveters, etc. Railway Turntables and Pivot Bridges. Gifford Injectors, Sellers' Improvements. New Patterns. Simple. Effective.
New York Office,
79 LIBERTY ST.



BARNES'
Patent Foot & Steam Power
MACHINERY.

Complete Outfits for actual workshop business. Lathes for wood or metal, Circular Saws, Scroll Saws, Formers, Mortisers, Tenoners, etc. Machines on trial if desired. Descriptive Catalogue and Price List free.
W. F. & JOHN BARNES,
1995 Main Street,
Rockford, Ill.

WORCESTER MACHINE SCREW CO.

AND 111 LIBERTY ST. NEW YORK
MANUFACTURERS OF
STANDARD MACHINE SCREWS.

C. W. LeCOUNT, South Norwalk, Conn.
LE COUNT'S HEAVY STEEL DOG,
With Steel Screws. Lathe Made and Hardened.

This Dog is very heavy, and is warranted not to break with any work.

No. 1	3-8 in	$ .50
" 2	1-2 "	.60
" 3	5-8 "	.70
" 4	3-4 "	.70
" 5	7-8 "	.80
" 6	1 "	.80
" 7	1 1-8 "	.96
" 8	1 1-4 "	.96
" 9	1 3-8 "	1.10
" 10	1 1-2 "	1.10
" 11	1 3-4 "	1.35
" 12	2 "	1.40
" 13	2 1-4 "	1.60
" 14	2 1-2 "	1.60
" 15	3 "	1.80
" 16	3 1-2 "	2.00
" 17	4 "	2.30
" 18	4 1-2 "	3.00
" 19	5 "	3.50
Full set, 19 Dogs,		26.35
No 20	5 1-2 in	4.25
" 21	6 "	5.00

When ordering, state as above, whether a full set, or a set of 12, or small set of Users of these dogs prefer them to any other make.

No. 1	3-8 in	.50
" 2	1-2 "	.60
" 4	3-4 "	.70
" 6	1 "	.80
" 8	1 1-4 "	.96
" 10	1 1-2 "	1.10
" 11	1 3-4 "	1.35
" 12	2 "	1.40

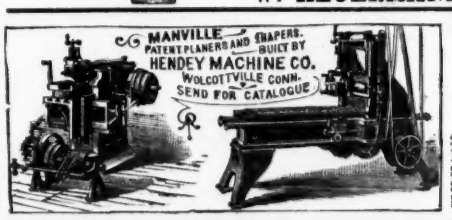
Small set of 8 Dogs from 3-8 to 2 inches, $7.30.

No. 14	2 1-2 in	$1.60
" 15	3 "	1.80
" 16	3 1-2 "	2.00
" 17	4 "	2.30

Set of 12 from 3-8 to 4 inches, $15.00.

ESTABLISHED 1850.

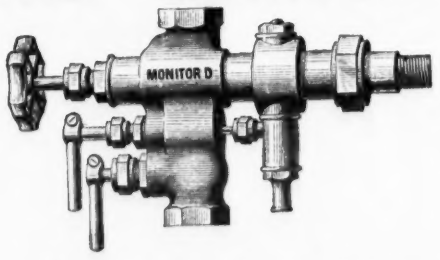
SCHAFFER & BUDENBERG,
NEW INJECTOR
Worked by Exhaust Steam Alone.
Takes the place of Feed Pump, Heater, and by Condensing the Exhaust Steam removes the Back Pressure.
UTILIZES A POWER HERETOFORE THROWN AWAY.
Works automatically at a steam pressure of less than half a pound. Adapted to all pressures.
For LOCOMOTIVES as well as STATIONARY ENGINES.
WORKS AT BUCKAU,—GERMANY.
DEPOT GENERAL OF THE UNITED STATES,
W. HEUERMANN, 40 JOHN STREET, NEW YORK.



The Hendey Machine Co.
TORRINGTON, CONN., U. S. A.
Manville Patent Iron Planers and Shapers.

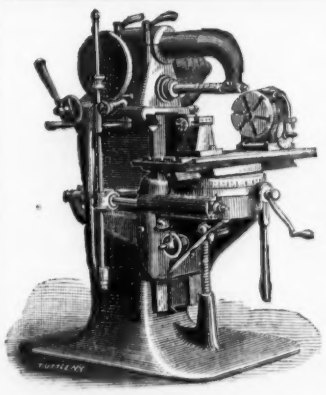
15 in. Shapers, 24 in. Shapers, 3½ ft. x 16 in., 5 ft. x 20 in., 6 ft. x 24 in., 8 ft. x 24 in. Planers, Amateurs' Hand Planers, with chuck and centers, Hollow Steel Spindle Hand Lathes, Brass and Wire Slitters, Spring Chuck, and Common Clock Lathes. Catalogue gives many names of users of our tools.

THE "MONITOR."



A NEW LIFTING & NON-LIFTING INJECTOR.
BEST BOILER FEEDERS IN THE WORLD.

FRIEDMANN'S
Patent Ejectors,
OR
WATER ELEVATORS,
For Conveying Water and Liquids.
Pat. Oilers & Lubricators, &c.
NATHAN & DREYFUS,
Patentees and Manufacturers,
92 and 94 Liberty Street,
NEW YORK.
Send for Illustrated Catalogue.

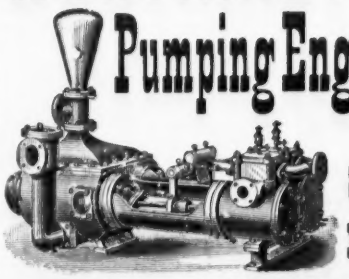


New Heavy Universal Milling Machine.

Correspondence solicited.

MANUFACTURED BY
C. E. LIPE, Syracuse, N. Y.

WORTHINGTON
Pumping Engines



AND
STEAM PUMPS.

HENRY R. WORTHINGTON,
239 Broadway, New York.
70 Kilby St., Boston. | 707 Market St., St. Louis.
Send for Latest Catalogue.

TESTIMONIAL

OF THE MERITS OF THE

HANCOCK INSPIRATOR.

AUBURN, N. Y., July 24, 1882.

HANCOCK INSPIRATOR CO.,

35 Beach St., Boston, Mass.

DEAR SIRS:

It gives us pleasure to say to you that we have used your No. 10 Inspirator exclusively for the past two years, on our portable boilers, and we pronounce them the best boiler feeder for portable use we have ever seen. We have never had any complaints from our customers; on the other hand, they prefer them to anything else. We are using your Locomotive Inspirators with equal success on our Traction Engines.

Yours Respectfully,

THE E. M. BIRDSALL CO.

This Company are using over 300 No. 10 Inspirators this year.

THE E. HORTON & SON CO.

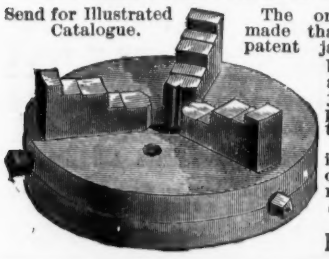
Canal St., Windsor Locks, Conn., U. S. A.

Only Manufacturers of the

HORTON Lathe and Car Wheel CHUCKS.

CAR WHEEL CHUCKS FROM 30 TO 42 INCH.

Send for Illustrated Catalogue.

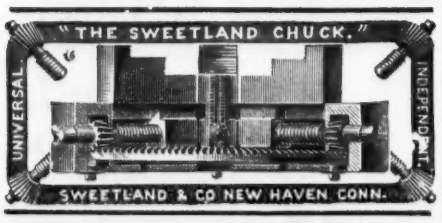


The only chucks made that use the patent jaw, with both face and bite of jaws ground perfectly true.

None genuine without our trade-mark "The Horton Lathe Chuck."

T. NEW'S PREPARED ROOFING.

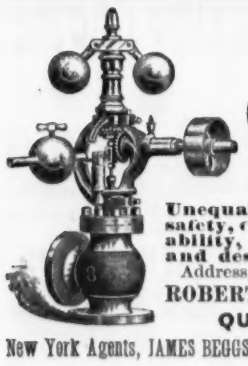
For steep or flat roofs. Applied by ordinary workmen at one-third the cost of tin. Circulars and samples free. Agents Wanted. T. NEW, 38 John Street, New York.



WOOD-WORKING MACHINERY.

☞Universal Wood Workers, Planing, Matching, Moulding, Band and Scroll Sawing Machines, Carriage, Wagon and Wheel Machinery, etc.

BENTEL, MARGEDANT & CO.,
HAMILTON, OHIO, U. S. A.



THE

GARDNER COMPENSATION GOVERNOR.

Unequaled for accuracy, safety, convenience, durability, workmanship, and design.

Address,

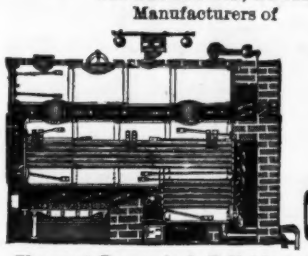
ROBERT W. GARDNER,
QUINCY, ILL.

New York Agents, JAMES BEGGS & CO., No. 9 Dey Street.

WM. T. BATE & SON,

CONSHOHOCKEN, PENNA.

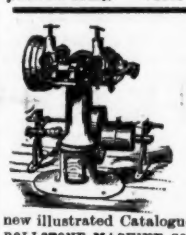
Manufacturers of



BATE'S PATENT STEAM Generator.

The most Economical, Reliable and Durable.

A large number of these boilers in use in the best establishments and institutions, showing Splendid Results in the way of economy, efficiency, durability and convenience of cleaning. We refer to parties using Write for particulars.



Dowel Machines,

Band Saws, Rotary and Stationary Bed Planers, and Buzz Planers, Jig Saws, Variety Moulding Machines, Wardwell's Patent Saw Bench, Pattern Makers' Lathe, Boring Machines, Waymouth Lathes and Gauge Lathes.

Also, a large stock of Second hand Machinery, consisting of Machinists' Tools, Woodworking Machinery and Engines and Boilers. Send Stamp for new illustrated Catalogue, Just out.

ROLLSTONE MACHINE CO., 45 Water St., Fitchburg, Mass.

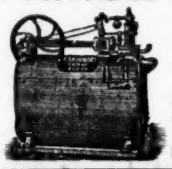
THE ALLIGATOR WRENCH,

Patented Aug. 31, 1875.

Teeth cut diagonally. Grips Round Iron or Pipe

AMERICAN SAW CO.
TRENTON, N. J.

PORTABLE and STATIONARY ENGINES And BOILERS,



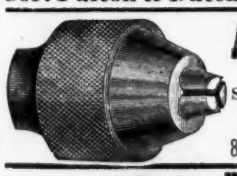
5 to 25 H. P. Parts duplicate and interchangeable, specially adapted to run Electric Light Machinery. Send for Circular.

SKINNER & WOOD, Erie, Pa.

Pattern and Brand Letters.

VANDERBURGH, WELLS & CO.

Cor. Fulton & Dutch Sts., New York.



Almond Drill Chuck.

Sold at all Machinists' Supply Stores.

T. R. ALMOND,
84 Pearl St., Brooklyn, N.Y

Holland & Thompson,

Troy, N. Y.

Manufacturers of the

HOLLAND LUBRICATOR

For lubricating the valves & cylinders of steam engines.

Operating with **downward visible drop.** The Principle of this Lubricator is entirely new; being the only one manufactured operating with a downward visible drop, and does not conflict with any other Patented Lubricator.

Protected with Letters Patent, granted July 5, 1881.

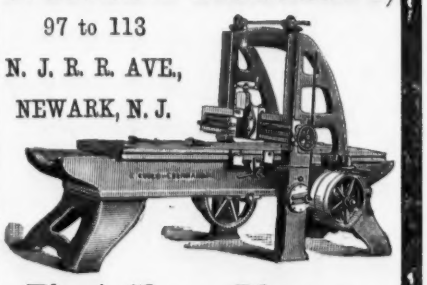
☞ A saving of from 50 to 90 per cent. in cost of oils.

For sale by

H. PRENTISS & CO.,
42 Dey St., New York.

E. GOULD & EBERHARDT,

97 to 113
N. J. R. R. AVE.,
NEWARK, N. J.



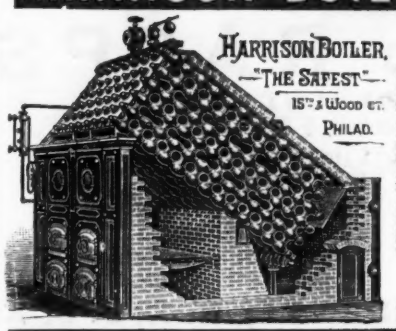
First-Class Planers.

22 x 22 x 5	feet.....	Weight, 3,500
26 x 26 x 6	"	" 5,500
26 x 26 x 8	"	" 5,800

Builders of Machinists' Tools.

HARRISON BOILER. "THE SAFEST"

Adapted for all Steam Purposes.



Merits have been proved during **ten** to **fifteen years constant use** by such concerns as Cheney Bros., South Manchester, Conn.; Wallace & Sons, Ansonia, Conn.; Wampanoag Mills, Weetamoe Mills, Sagamore Mills, Fall River, Mass.; Sears' Building, Boston, Mass.; Brown & Sharpe Mfg. Co., Providence, R. I.; A. T. Stewart & Co., Tiffany & Co., New York; Stevens' Institute, Hoboken, N. J.; Matthiessen & Wiecher's Sugar Refinery, Jersey City, N. J.; Wm. Sellers & Co., S. S. White, Daniel Allen, Jno. Gardiner & Co., Phosphor-Bronze Smelting Co., Henry Bower, Evening Bulletin, Saturday Night, Philadelphia, Pa., and numerous others.

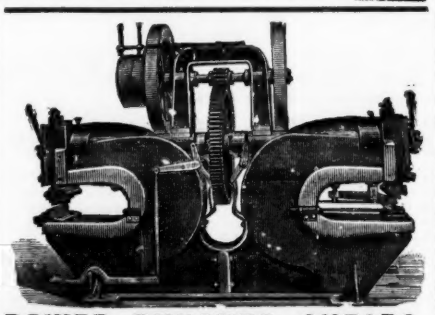
Franklin Institute Medal awarded for SUPERIORITY OF EVAPORATIVE EFFICIENCY, ECONOMICAL CAPACITY FOR GENERATING STEAM AND DYNAMIC VALUE OF STEAM. Easily transported on mule back. Send for Descriptive Catalogue.

HARRISON BOILER WORKS
15th and WOOD STS., PHILADELPHIA, Pa.

HOLROYD & CO., Waterford, N. Y.

Manufacturers of STOCKS and DIES.

For MACHINISTS, BLACKSMITHS & GAS FITTERS



POWER PUNCHES, SHEARS HAMMERS.

We make over 100 sizes of Punches and Shears Double and Single, varying from 500 to 36,000 pounds in weight, and adapted for every variety of work. The Double machines are equal to two Single ones as each side is worked independently. Also

ADJUSTABLE HELVE CUSHIONED HAMMERS

Of all sizes, unequalled for efficiency and durability

The Long & Allstatter Co.,
HAMILTON, OHIO.

The Inventors' Institute,

COOPER UNION,

3d & 4th Avenues, 7th & 8th Sts., New York City.

Recently enlarged, the Inventors' Institute now embraces, in addition to the suite of rooms occupied by its PATENT LAW DEPARTMENT, the INDUSTRIAL NEWS, and the officers of the Institute, 9 large halls with full front and entrances both on 3d and 4th avenues as well as on 7th and 8th streets. The whole is open free to the public.

Attention is invited to the advantages afforded for the exhibition under the most favorable auspices of improved machines, appliances and processes in all lines of industry and especially of new inventions. Ample power is furnished; proper care is taken of all exhibits. To NON-RESIDENT EXHIBITORS the advantages of an established agency in New York are afforded at moderate cost.

For full particulars address

THE INVENTORS' INSTITUTE.

THE

Slate Sensitive Drill.

Adapted to rapid work with small drills. Its extreme sensitiveness prevents clogging and breakage of drills. Has a swinging table with attachment for center drilling. Instantly adjustable to different lengths of work. Over 200 already in use. Send for circular

DWIGHT SLATE,
HARTFORD, CONN.

P. BLAISDELL & CO.
Manufacturers of
Machinists' Tools,
WORCESTER, MASS.

ALLEN'S HIGH SPEED AIR COMPRESSORS.

Allen Engines, Stationary and Marine Boilers, Hoisting Machinery, Patent Evaporators and Condensers.

JOHN McLAREN,
RIVER STREET, HOBOKEN, N. J.

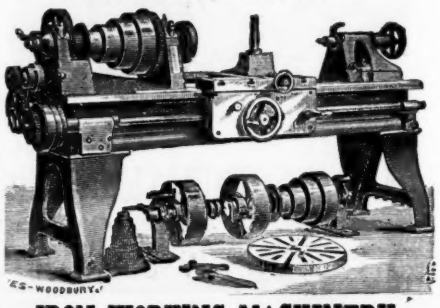
MACHINERY FOR REDUCING AND POINTING **WIRE**

by compression or swaging **COLD.** Machines manufactured under patents owned by Miller, Metcalf & Parkin, Pittsburgh, Pa. For machines or information, address

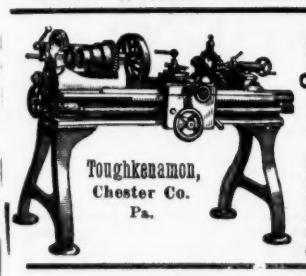
S. W. GOODYEAR,
WATERBURY, CONN.

A. M. POWELL & CO.,

WORCESTER, MASS, U. S. A.

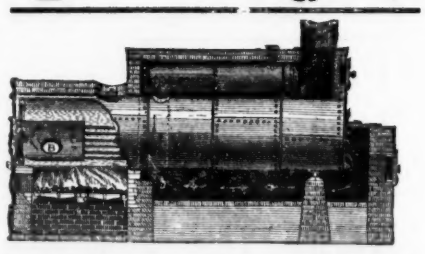


IRON WORKING MACHINERY.



Toughkenamon, Chester Co. Pa.

S. ASHTON HAND,
MAKER OF
FIRST-CLASS
Engine Lathes



BRIDGEPORT BOILER WORKS,

BRIDGEPORT, CONN.

LOWE & WATSON, Proprietors,

MANUFACTURERS OF

The Lowe Patent Tubular Boiler, with and without Superheating Drums. Fourteen years' use proves them the most durable and reliable boiler known. Gives dry steam. The process for combustion of the gases is in the construction and setting. Burns any fuel; obtains as much result from it as any boiler or setting with no more cost, and greater durability.

☞**Send for descriptive Circular.**

SCHUTTE & GOEHRING, Manufacturers of

KORTING'S DOUBLE TUBE INJECTOR.

OVER 30,000 IN USE.

THE LEADING BOILER FEEDER.

OPERATED BY ONE HANDLE.

WORKING UNDER ALL CONDITIONS.

WILL LIFT HOT WATER. POSITIVE IN ITS ACTION.

SEND FOR CIRCULAR.

OFFICES AND WAREROOMS:

12th and Thompson Sts., Philadelphia.
A. F. UPTON, 7 Oliver St., Boston.
POND ENGINEERING CO., 709 Market St., St. Louis
C. F. KENNEDY, 194 15th St., Denver, Col.
G. R. LOMBARD & CO., 1026 Fenwick St., Augusta, Ga.
A. ALLER, 109 Liberty St., New York.
M. C. BULLOCK MFG. CO., 84 Market St., Chicago.
GEORGE A. SMITH, 1419 Main St., Richmond, Va.
H. P. GREGORY & CO., 2 California St., San Fran'co.

A FIRE-PROOF NON-CONDUCTOR OF HEAT AND SOUND.

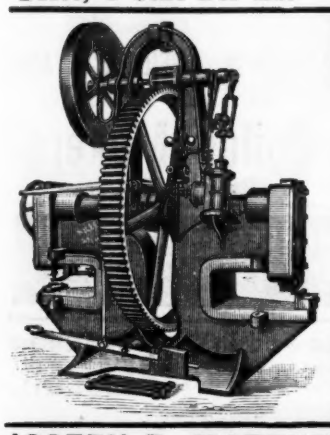
Made from Slag of blast furnaces. Encases about 90% of its volume of air. Heaviest grade about 25 lbs. per cu. ft.

MINERAL WOOL

U. S. Mineral Wool Co.

16 CORTLANDT STREET, NEW YORK.

Price, 1 Cent Per Lb.



COMBINED PUNCH AND SHEAR,

BUILT BY

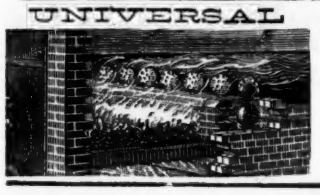
HILLES & JONES,

WILMINGTON, DEL.

The annexed cut is taken from our No. 4 size with Engine attached for driving. Pulleys are in all cases supplied unless engine is especially contracted for. The Shear runs at all times when the belt is on the tight pulley, but the punch end can be stopped and started by a clutch, and for very particular work the hand wheel is used to set the punch to mark before throwing in the clutch. The stripper is adjustable to different kinds of iron. Either punch or shear supplied separately. FIVE sizes.

JOSEPH B. MATTHEWS, 41 Center Market Space, Baltimore, Md.
Manufacturer of the MATTHEWS
AUTOMATIC HIGH-SPEED ENGINE,
For Electric Lights and other purposes requiring steady, reliable power. The best and cheapest in the market. 25 H. P. for $500. Send for Circular.

UNIVERSAL



PATENT FURNACE,
SAVES FUEL AND INCREASES BOILER CAPACITY.
CORRUGATED GRATE BARS,
Suitable for Furnace Coal, Screenings, and all kinds of Waste Fuel.
JAMES MAHONY, 73 Astor House, New York.

BULKLEY CONDENSER,

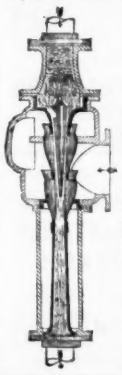
For every class of Steam Engines, Steam Pumps, Vacuum Pans, &c.

Guaranteed to Save 20 to 25 per cent. of fuel, or gain 25 to 30 per cent. in power.

Send for pamphlets, prices, references, &c.

HENRY W. BULKLEY,
149 BROADWAY, N. Y.

SCHUTTE & COEHRING,
Manuf's of



KORTING CONDENSER.
For Steam Engines and Pumps.
Requires no Air Pump and no foundations. Only 15 ft. height of water required from level of water supply to discharge pipe, instead of 34 ft., whether above or below engine cylinder. Has fewer parts, and is lower in price than any other condenser. Send for circular giving full information.
Offices and Warerooms:
12th & Thompson Sts., Philadelphia.
A. Aller, 109 Liberty St., New York.

FRICTION CLUTCH PULLEYS AND CUT-OFF COUPLINGS,
JAS. HUNTER & SON, North Adams, Mass.

NUT TAPPING MACHINE.
DURRELL'S PATENT.
No. 1 Machine, 900 lb., 7 spindles.
" 2 " 1,050 " 7 "
" 2 " 600 " 3 "
Capacity of 7 Spindles, 8,000 per 10 hours. Acknowledged to be an indispensable tool. Manufactured by
HOWARD BROS.,
Fredonia, N. Y.

JOHN H. WRIGHT, BRIDGEPORT, Conn.
MANUFACTURER OF
Lathes and Planers,
FROM THE LATE WOOD, LIGHT & CO.'S PATTERNS,
Having formerly been a contractor in building the same, will give first-class work to all who favor me with their orders.

MECHANICAL DRAWINGS.
Copies or Tracings of any class of machinery made and used in Europe. 2000 designs. WOOD & RICHMOND, Mechanical Engineers and Draughtsmen, 176 Broadway, N. Y.

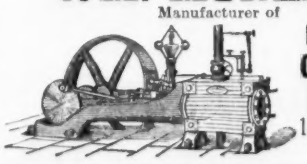
VOLNEY W. MASON & CO.
Friction Pulleys, Clutches and Elevators,
PROVIDENCE, R. I.

THOMAS D. STETSON,
PATENT SOLICITOR & EXPERT,
No. 23 Murray St., New York.

Ross Fluid Pressure Reducer,

FOR
Steam, Water, Air and Gas.
Automatically reduces the pressure in pipes to any desired extent.
Manufactured by the
Ross Valve Co.
652 RIVER ST., TROY, N. Y.
Simplest! Cheapest! Best!
Send for Circular.

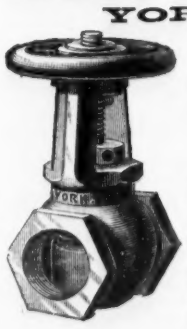
WM. MÜNZER,
Manufacturer of



IMPROVED CORLISS ENGINE.
1st Av. cor. 30th St.
New York.

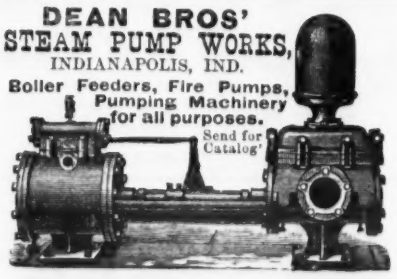
R. W. REXFORD,
Successor to L. B. EATON & REXFORD,
MECHANICAL ENGINEER & EXPERT,
11 NORTH 6th ST., PHILADELPHIA.
Importer and Manufacturer of and Dealer in all Descriptions of
TOOLS.
Will furnish Information, Quotations, etc., of TOOLS and MACHINERY. The only Exclusive and Practical TOOL STORE in Philadelphia.

DIAMOND BRASS WORKS,
YORK, Pa.



Manufacturers of the
YORK GLOBE VALVE.
These Valves, 1 inch and over, have *outside* screws, insuring great durability. Can be reground without other tools than wrench and screw driver. Can be repacked with steam on either side of valve. All Valves proved before shipping. Price as low as the ordinary globe valve.

DEAN BROS'
STEAM PUMP WORKS,
INDIANAPOLIS, IND.
Boiler Feeders, Fire Pumps, Pumping Machinery for all purposes.
Send for Catalog.



CLEM & MORSE,
413 Cherry Street, Philadelphia.
108 Liberty Street, New York.
Passenger and Freight Elevators,
WITH MOST APPROVED SAFETY DEVICES.
Represented in Boston by C. E. KIMBALL.
New Orleans, La. by HUGH W. MONTGOMERY.
St. Paul, Minn., by ROBINSON & CARY.
Ogden, Utah, by D. D. JONES.

PECK'S PAT. DROP PRESS.
BLAST FORGES.
STEEL & IRON DROP FORGINGS.
Drop Dies and Special Machinery.
BEECHER & PECK, NEW HAVEN CONN.

Fox Lathes,
Turret Head Lathes,
AND
SWIVEL HEAD ENGINE LATHES,
GEORGE GAGE, WATERFORD, N.Y.

THE REID DRILL CHUCK

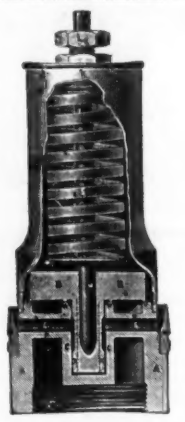
The Strongest, most Simple and greatest Capacity of any in the market. Sold by all first-class Machinists' Supply Stores. Manufactured by
CHAS. H. REID,
DANBURY, CONN.

20 INCH SWING
ENGINE LATHES.
F. C. & A. E. ROWLAND,
New Haven, Conn.

SHEFFIELD GRATE BAR.

For all kinds of Fuel. Send for Circular.
POND ENGINEERING COMPANY,
709 Market Street, St. Louis, Mo.
130 W. Second Street, Cincinnati, O.

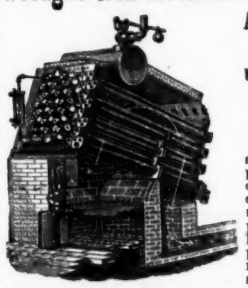
Crosby's Improved



"Pop" Safety Valve.

CROSBY STEAM GAGE & VALVE CO.
J. H. MILLETT, Pres't. GEO. H. EAGER, Treas.
GEO. H. CROSBY, Sup't. WALTER P. CLARK, Sec'y
Sole Proprietors and Manufacturers of CROSBY'S
Adjustable "Pop" Safety Valve.
Improved Steam Pressure Gage.
Self-Closing Water Gage.
Improved Steam Engine Indicator.
Sole Manufacturers and General Agents for The "VICTORY" Steam Cylinder Lubricator, "Single Bell Chime Whistle," "Bay State Steam Muffler," and all instruments for use on Steam Engines, Boilers, &c., send for particulars.
97 OLIVER ST., BOSTON, MASS.

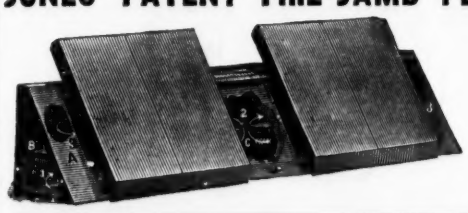
ROOT'S
Wrought Iron Sectional Safety Steam Boiler
ABSOLUTELY SAFE FROM EXPLOSIONS.



Unequaled in Economy of Fuel and Rapid Generation of Dry Steam.
All parts interchangeable. Easily erected in places inaccessible to other boilers. Altered or enlarged by any ordinary machinist. Shipped in packages weighing under 150 lbs. each. Low in price and first-class in material and workmanship
Over 260,000 H. P. in Use for all purposes.
Catalogues and Conclusive References mailed to any address. Drawings and full instructions for erection furnished with each boiler, making errors impossible.
ABENDROTH & ROOT MFG. CO. 28 CLIFF ST. NEW YORK.
AGENTS:
M. C. BULLOCK, 80 Market St., Chicago, Ill.
ALEX. E. BROWN, 130 Water St., Cleveland, Ohio.
GEO. J. ROBERTS & CO., Dayton, Ohio.

THOS. DANIEL,
PATTERN MAKER
60 FULTON ST., NEW YORK.
Electrical and Intricate Core Work a Specialty.

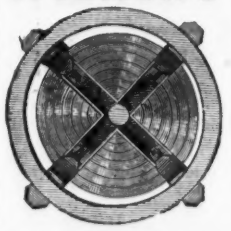
JONES' PATENT FIRE-JAMB PLATES & BOILER SETTING.



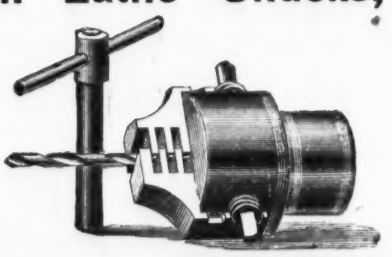
Furnish permanent and perfect protection to the boiler front and supply heated air at the bridge wall to aid in combustion of gases.
Ask your Boiler Maker for it.
Manufactured by
Cohoes Iron Foundry and Machine Co.
COHOES, N. Y.

KENSINGTON ENGINE WORKS, (Limited,)
Vienna and Beach Sts., - - - PHILADELPHIA.
ENGINEERS AND MACHINISTS,
Manufacturers of
BUCKEYE AUTOMATIC ENGINES
For Middle and South Atlantic States.
SPECIAL MACHINERY BUILT TO ORDER.
H. C. FRANCIS, Manager. JOHN T. BOYD, Engineer. WM. L. SIMPSON, Supt.

Westcott's Combination Lathe Chucks,



Both Scroll and Geared.
Greater capacity. Jaws reversible. No projecting screws in the rim. Movements independent, universal and eccentric.
Oneida Steam Engine and Foundry Co.
Send for circulars. ONEIDA, N. Y.



THE HARTFORD AUTOMATIC CUT-OFF ENGINE.

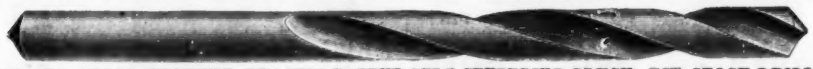
Built for Heavy and Continuous Work, and adapted to any required speed
Close regulation and best attainable Economy of Fuel. Circular and Practical Treatise on Steam Engineering sent on application.
The Hartford Engineering Company,
HARTFORD, CONN.
New York Office,
Rooms 72 and 73 Astor House.
Hill, Clarke & Co., Agents,
86 Oliver St., Boston.

MORSE TWIST DRILL & MACHINE COMPANY,

NEW BEDFORD, MASS.

Sole Manufacturers of

MORSE PATENT STRAIGHT-LIP INCREASE TWIST DRILL,



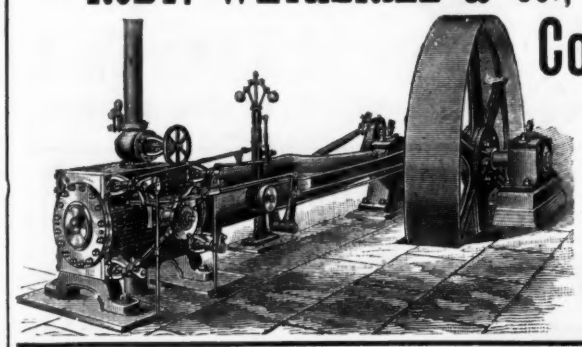
SOLID AND SHELL REAMERS, BEACH'S PATENT SELF-CENTERING CHUCK, BIT STOCK DRILLS.

Drills for Coes, Worcester, Hunter and other Hand Drill Presses. Drill Grinding Machines, Center and Adjustable Drill Chucks, Taper Reamers, Milling Cutters, and Special Tools to order.

All Tools Exact to Whitworth Standard Gauges.

GEO. R. STETSON, Sup't. EDWARD S. TABER Pres't and Treas

ROBT. WETHERILL & CO., CHESTER, PA.



Corliss Engine Builders,

Condensing, Non-condensing, and Compound.

HIGHEST EFFICIENCY AND GREATEST ECONOMY.

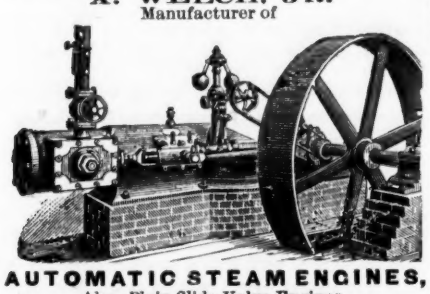
Boiler Makers.

Hydraulic Riveting.

LAMBERTVILLE IRON WORKS,

A. WELCH, JR.

Manufacturer of



AUTOMATIC STEAM ENGINES,

Also, Plain Slide Valve Engines.

Send for Circular. LAMBERTVILLE, NEW JERSEY.

F. W. MOSS,

80 JOHN ST., N. Y.

STEEL AND FILES,

HAMMERS.

Warranted Cast Steel, for Dies, Punches, Drills, Turning Tools, Taps, Reamers, &c.

IMP'D MILD-CENTRED CAST STEEL

For Taps, Reamers, &c.

FRANK THOMPSON,

Monitor, Hand, Speed and Back Geared

LATHES.

Slide Rests, Chucks and Brass Finishers Tools of the finest quality.

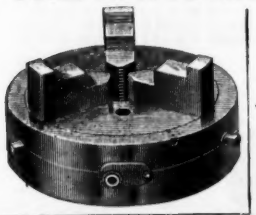
168 CENTRE STREET, N. Y. CITY.

CHARLES MURRAY,

Engraver on Wood,

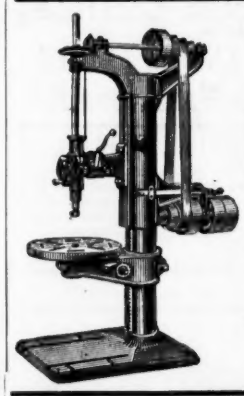
50 ANN ST. NEW YORK.

"THE NATIONAL CHUCK"



WARRANTED SUPERIOR TO ANY CHUCK IN THE MARKET

NATIONAL M'F'G CO. NEW HAVEN, CONN



H. BICKFORD,

Manufacturer of

Drills

AN EXCLUSIVE

SPECIALTY.

N. W. Corner

Pike and Front Sts.

CINCINNATI, O.

IMPROVED MACKENZIE BLOWER

MADE BY

SMITH & SAYRE MF'G CO.

245 Broadway, New York.

HAS NO EQUAL FOR A PRESSURE BLAST.

GIVES A DEFINITE QUANTITY OF AIR without reference to condition of Cupola.

SPEED AND POWER **LESS** THAN FOR ANY OTHER BLOWER.

WILL GIVE ANY REQUIRED PRESSURE

AT 50 to 100 REVOLUTIONS PER MINUTE.

SEND FOR PRICES.

CRITCHLEY'S PATENT EXPANDING REAMER.

Manufactured by CRITCHLEY & WHALLEY,

Send for Circular. PORTSMOUTH, N. H.

Ludlow Valve Mfg. Co.

OFFICE AND WORKS:

938 to 954 RIVER ST.,

AND

67 to 83 VAIL AVE.

TROY, N. Y

VALVES—Double and Single Gate, ¼ in. to 48 in. outside and inside Screws, Indicator, etc., for Gas, Water and Steam.

Also,

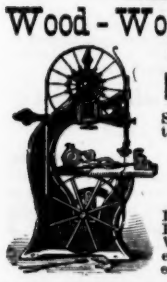
FIRE HYDRANTS.

SEND FOR CIRCULAR.

J. A. FAY & CO., CINCINNATI, Ohio, U. S. A.

BUILDERS OF IMPROVED

Wood-Working Machinery.



Embracing nearly 400 Machines for

Planing & Matching,

Surfacing, Moulding, Tenoning, Mortising, Boring, and Shaping, &c.

Variety and Universal

WOOD WORKERS.

Band, Scroll and Circular Saws, Resawing Machines, Spoke and Wheel Machinery, Shafting, Pulleys, etc. All of the highest standard of excellence.

W. H. DOANE, Pres't. D. L. LYON, Sec'y

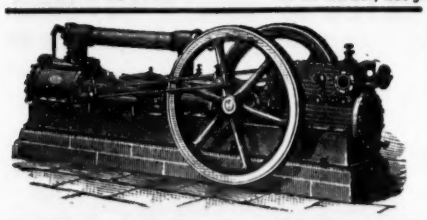
TOOLS.

Machinists, Engineers, Model Makers and all classes of Mechanics can find **TOOLS** to suit them at

184 to 188 WASHINGTON STREET, BOSTON, MASS.

A. J. WILKINSON & CO.

CATALOGUES FREE.



STEAM PUMPS, AIR COMPRESSORS, Friction Hoisting Engines, Vacuum Pumps and Condensers, General Machinery, Steam Engines. Capacity to bore cylinders 110 in. diameter and turn Fly Wheels of 24 feet.

The Norwalk Iron Works Co.

SOUTH NORWALK, CONN.

New Haven Manf'g Co.

NEW HAVEN, CONN.

IRON-WORKING MACHINERY

"The Only Perfect"

BUFFALO PORTABLE FORGES.

The Lightest, Strongest, most durable, easiest working, and in every way

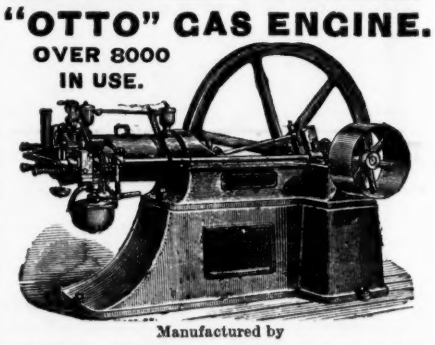
The Best Portable Forge Made.

BUFFALO FORGE CO.

Buffalo, N. Y.

"OTTO" GAS ENGINE.

OVER 8000 IN USE.



Manufactured by

SCHLEICHER, SCHUMM & CO., 33d & Walnut Sts., Philada.

ECLIPSE PORTABLE & TRACTION ENGINES

Stationary Engines.

Iron and Steel Boilers.

Portable Circular Saw Mills.

Threshers & Separators.

Send for Catalogue and say where you saw this.

FRICK & CO.

Waynesboro, Franklin Co., Pa.

WHITCOMB MANFG. CO.

WORCESTER, MASS.

Manufacturers of

Hand & Power Shears

And Punches all sizes.

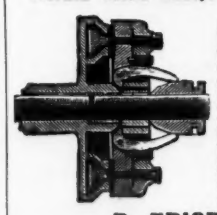
Taft's Patent.

These Shears supersede all others for ease in working, durability and simplicity.

HOISTING ENGINES AND ELEVATORS.

Safe, Durable and Reasonable in Price.

Friction Clutch Pulleys and Cut-off Couplings.



We manufacture the "Giant Friction Clutch Pulley," known as the "Captain," is the **Best in the World** for connecting the gearing of callender rolls, hoisting coal, logs or freight. Our Clutch can connect any amount of power, at any speed, without slacking the motive power in the least, and gives no shock, is easy to ship and unship, in fact, this is the only Clutch that can do heavy work satisfactorily.

D. FRISBIE & CO.

123 North Fourth St., Philada., Pa.

THE KEYSTONE INJECTOR

SIMPLEST & BEST, BOILER FEEDER

MANF'CD BY

E. TRACY

511 & 513 N. 12TH ST,

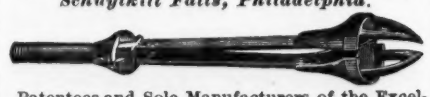
PHILADELPHIA PA.

SEND FOR CIRCULAR.

WE CHALLENGE THE WORLD FOR ITS EQUAL

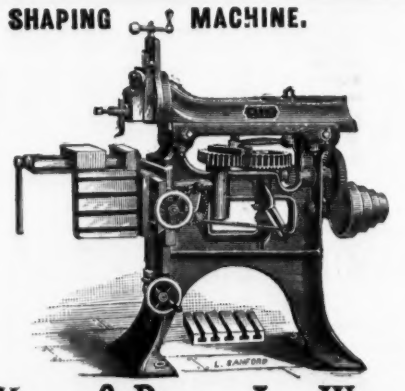
RUFFNER & DUNN,

Schuylkill Falls, Philadelphia.



Patentees and Sole Manufacturers of the Excelsior Steel Tube Cleaners. $1.00 per inch. Most liberal discounts to dealers. Send for circular.

SHAPING MACHINE.



Hewes & Phillips' Iron Works,

NEWARK, N. J.

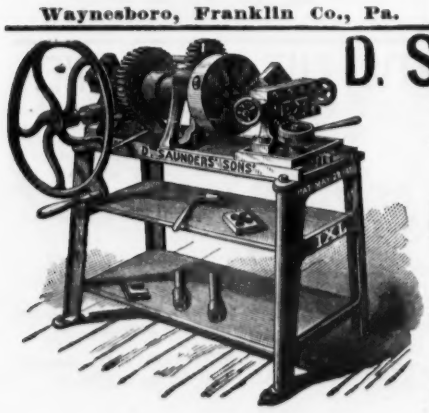
Manufacturers of the New

Patent High Speed Allen Engine,

PLANERS, LATHES, SHAPERS, SLOTTERS, DRILL PRESSES,

Both double and single column, Bolt and Pipe Cutters, Keyseating Machines, Hydraulic and Sugar Estate Machinery, Shafting and Gearing, Boilers, & Heavy Hydraulic Oil Presses a specialty.

One 48" x 48" x 12 ft. Planer in stock.



D. SAUNDERS' SONS,

MANUFACTURERS OF THE ORIGINAL

TRADE **I.X.L.** MARK

Pipe Cutting & Threading Machine,

BEWARE OF IMITATIONS.

None Genuine without our Trade-Mark and Name.

STEAM AND GAS FITTERS' HAND TOOLS,

Pipe Cutting and Threading Machines,

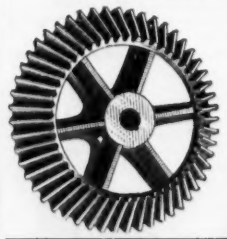
For Pipe Mill use a Specialty.

Send for Circulars. YONKERS, N. Y.

ARMSTRONG'S IMPROVED ADJUSTABLE STOCK AND DIES FOR PIPE AND BOLTS.

Tapped to the U. S. and Whitworth Standard Gauges. *Adjustable* to all variations in the size of fittings. Can be *resharpened without drawing the temper* by simply grinding them. Possessing practical advantages appreciated by all mechanics. Circulars sent free on application.

Manufactured by F. ARMSTRONG, Bridgeport, Conn.



ALSO,

LEFFEL TURBINE

Water Wheels.

POOLE & HUNT,

BALTIMORE, Md.

HALBERT E. PAINE, late Commissioner of Patents. STORY B. LADD

PAINE & LADD,

Solicitors of Patents & Att'ys in Patent Cases,

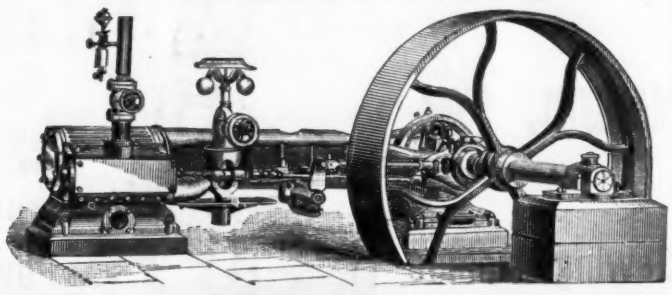
Washington, D. C.

WOODBURY, BOOTH & PRYOR.

Manufacturers of

ROCHESTER N. Y.

Automatic Cut-Off,
Fixed Cut-Off,
and Slide Valve
STEAM
ENGINES,
Tubular Boilers.



HEWES & PHILLIPS' IRON WORKS,

NEWARK, N. J.

Manufacturers of

The ALLEN PATENT HIGH-SPEED ENGINE.

Both Condensing and Non-Condensing, especially designed and constructed for the Rolling and Cotton Mill Trade, and all establishments requiring an absolutely uniform and economical power.

Tubular Boilers and Steam Fittings. Contracts taken tor complete Motive Power Outfits.

KELLY & LUDWIG, 49 & 51 N. SEVENTH ST. PHILADELPHIA, Pa.

NEW IRON WORKING MACHINERY On Hand or for Quick Delivery.

Write for prices and particulars.

ENGINE LATHES.

38 inch, triple-geared (bed to suit).			Fitchburg.
28 inch swing,		18 foot bed.	Fitchburg.
26 "	"	18 "	Fitchburg.
24 "	"	14 and 16 "	Fitchburg.
21 "	"	12 and 14 "	Blaisdell.
20 "	"	14 "	Fitchburg.
20 "	"	12 "	Fifield.
19 "	"	10 and 12 "	Gray.
18 "	"	10 and 12 "	Blaisdell.
17 "	"	6 "	Johnson.
16 "	"	6 and 8 "	Fitchburg.
14 "	"	6 and 8 "	Fitchburg.
13 "	"	8 "	Blaisdell.

PLANERS AND SHAPERS.

30 inch x 30 inch x 8 foot,	Fitchburg.
25 inch x 25 inch x 8 foot,	Fitchburg.
30 inch x 30 inch x 10 foot,	Hewes & Phillips
36 inch x 36 inch x 9 ft., planer. 2d hand, good order.	Wheeler.
26 inch x 24 inch x 6 and 7 ft. planer,	Wheeler.
22 inch x 20 inch x 4 ft. planer,	Wheeler.
10 inch stroke shaper,	Fitchburg.
15 inch stroke crank planer,	Blaisdell.
10 inch stroke shaper,	Gould.
15 inch stroke shaper,	Gould & Eberhardt.

DRILL PRESSES.

60 inch radial drill, double-geared, self-feed, planed and slotted bed-plate with portable table. Best English make. Weight 4 tons.

48 inch radial drill, self-feed, double gearing slotted and planed bed. Betts.

30 inch, back-geared, automatic,	Prentice.
25 inch, back-geared, self-feed,	Fitchburg.
25 inch, quick return,	Blaisdell
19 inch, " "	Blaisdell.
18 inch, " "	Blaisdell & Fitchburg.
2, 3, and 4 spindle drills,	Garvin.
15 inch swing, 5 foot bed, Fox Lathe,	Gage.
No. 2 (¼-1¼) Bolt Cuttters,	Merrimans.
Power and Hand Millers,	Garvin.
12 inch slotter (swing 56 inch),	Hewes & Phillips.

IRON PLANERS,
DRILLING MACHINES,
ENGINE LATHES,
IRON SHAPERS,
ENGINES & BOILERS

A GENERAL LINE OF

IRON AND WOOD WORKING

MACHINERY.

TOOLS & SUPPLIES

In Store and to Arrive.

O. L. PACKARD,

Milwaukee, Wisconsin.

SEND FOR LIST OF

IRON WORKING MACHINERY

ON HAND.

NEW AND SECOND-HAND.

SPECIALTIES.

Extra Heavy Bridgeport 16 in. Swing Engine Lathes.

SECOR SCREW MACHINES.

WRITE FOR WHAT YOU WANT.

E. P. BULLARD,

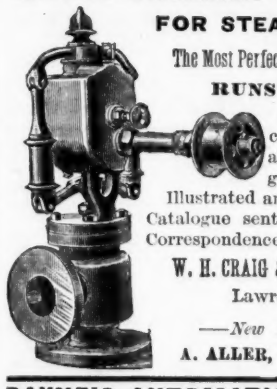
14 DEY STREET, NEW YORK.

CRAIG'S HYDRAULIC GOVERNOR,

FOR STEAM ENGINES,

The Most Perfect Governor Known.

RUNS IN OIL.



Guaranteed to accurately regulate all classes of engines.

Illustrated and descriptive Catalogue sent on application. Correspondence solicited.

W. H. CRAIG & CO., Sole Manufr's,

Lawrence, Mass.

—New York Agent—

A. ALLER, 109 Liberty St.

PAYNE'S AUTOMATIC ENGINES,

Established 1840.

Spark Arrester.

Vertical Portable.

Reliable, durable and economical. *will furnish a horse power with ¼ less fuel and water than any other engine built*, not fitted with an automatic cut-off. Send for illustrated Catalogue c. c., etc. for information and prices. B. W. PAYNE & SONS,

Box 1230. CORNING, N. Y.

HILL, CLARKE & CO.

BOSTON, MASS.

Branch Office, 800 North Second Street, St. Louis, Mo.

Machinists' Power Tools & Supplies.

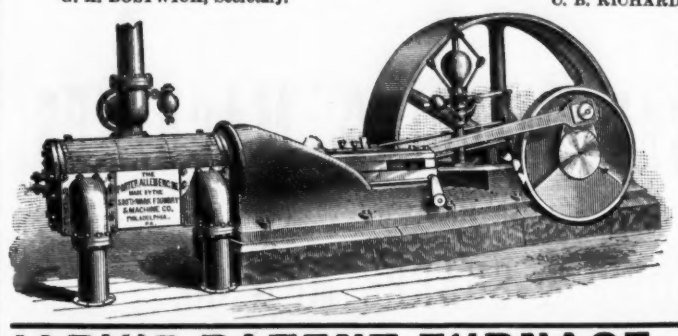
SPECIAL AND EXCLUSIVE AGENTS FOR

BRAINARD MILLING MACHINE CO., Gear Cutting Machines.
FLATHER & CO., Hollow Spindle Engine Lathes & Turret Machines.
A. M. POWELL & CO., 26 in. Engine Lathes and 22 in. Planers.
WILLIAM GLEASON, Engine Lathes and Planers.
LATHE & MORSE TOOL CO., Lathes and Planers.
WILLIAM H. WARREN, Shapers and Radial Drills.
NATIONAL MANUFACTURING CO., Bolt Cutters.

THE PORTER-ALLEN HIGH SPEED ENGINE.

W. H. MERRICK, President and Treas.
G. A. BOSTWICK, Secretary.

C. T. PORTER, Vice-President.
C. B. RICHARDS, Superintendent.

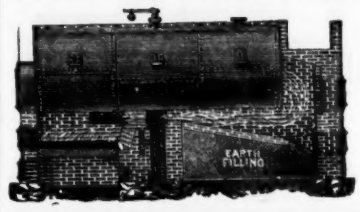


THE SOUTHWARK FOUNDRY & MACHINE CO., Philada., having largely increased its facilities is now prepared to fill all orders for the Porter-Aller Engine on contract time.

Orders solicited for Iron and Brass Castings in the rough.

Address the Company, 430 Washington Avenue, Phila., Pa.

JARVIS PATENT FURNACE FOR SETTING STEAM BOILERS.



Economy of Fuel, with increased capacity of steam power. The same principle as the SIEMANS' PROCESS OF MAKING STEEL, utilizes the waste gases with hot air on top of the fire. Will burn all kinds of Waste Fuel without a blast, including screenings, wet peat, wet hops, sawdust, logwood chips, slack coal, &c.

A. F. UPTON, General Agent,

Send for circular. 7 Oliver St. (P. O. Box 3401,) Boston, Mass.

BERTON & NICKEL, New York Agents,
No. 92 Liberty Street.
POND ENGINEERING CO., Western Agents,
709 Market Street, St. Louis,
And 130 W. Second St., Cincinnati, Ohio.

TO INVENTORS AND MANUFACTURERS

THE 51st GRAND EXHIBITION
Of the AMERICAN INSTITUTE
Of the City of New York,

Will open September 27, 1882. Heavy machinery will be received as early as August 26th; other goods September 12th. Intending exhibitors must make early application to secure proper space and classification. For blanks and information address

GEN'L SUP'T AMERICAN INSTITUTE,
New York City.

CORLISS ENGINES FOR SALE.

PROMPT DELIVERY.

One 12 inch Cylinder. 36 inch Stroke. At once.
One 14 " 36 " In two weeks.

APPLY TO

THE GEORGE PLACE MACHINERY CO.
121 Chambers & 103 Reade Sts., New York.

NEW & SECOND-HAND MACHINERY.
AUG. 29, 1882.

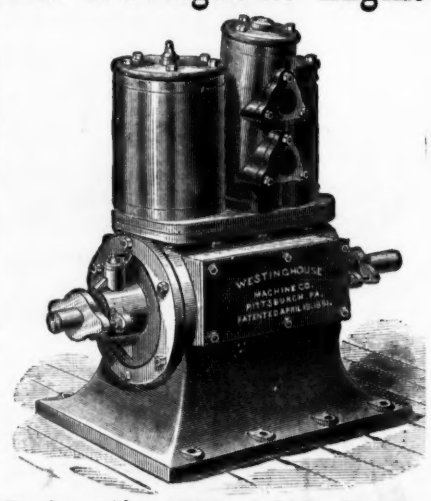
1	Engine Lathe,	14 in. x 5, 6 & 7 ft.	Grant & Bogert.
1	" "	42 in. x 14 ft. New.	[New.
1	" "	36 in. x 12, 17 ft. New.	
1	" "	21 in. x 6 ft. In good order.	Pond.
1	" "	14 in. x 6 ft. Star Tool Co.	New.
1	" "	15 in. x 6 ft.	"
1	" "	14 in. x 5 x 6 ft.	"
1	" "	16 in. x 6, 7 & 8 ft. Bridgeport.	"
1	" "	13 in. x 5 ft & 6 ft. Ames.	"
1	" "	16 in. x6, 7 & 8 ft. Ames.	"
1	" "	18 in.x8 & 10 ft. Lodge & Barker	"
1	" "	24 in. x 12 ft. Perkins.	"
1	" "	24 in. x 16 ft. "	"
1	" "	30 in. x 16 ft. "	"
1	" "	22 in. x 10 ft. Fifield. New.	
1	" "	28 in. bed to suit. New. Fifield.	
1	" "	11 in. x 4 ft. & 5 ft. Prentiss.	
1	" "	11 in. x 4 ft. New.	
1	" "	12 in. x 5 ft. Young. New.	
1	Plain Engine Lathe,	16 in. x 4 ft.	"
1	Engine Lathe,	15 in. x 4 ft. Plain. New.	
1	Fox Lathe,	25 in. x 5 ft. Am. Tool & Machine Co.	
1	15 in. x 4 ft.	Turret Lathe. Lodge & Barker.	
1	Planer,	48 in. x 48 in. x 12 ft. New.	
1	"	38 in. x 38 in. x 8 ft. "	
1	"	36 in. x 36 in. x 18 ft. "	
1	"	16 in. x 14 in. x 3½ ft. "	
1	"	22 in. x 20 in. x 5 ft. "	
1	"	28 in. x 28 in. x 6 ft. A1 order.	
1	"	16 in. x 16 in. x 3 ft.	new
1	"	24 in. x 24 in. x 6 ft. Hendey.	"
1	"	26 in. x 26 in. x 7 ft.	
1	Upright Drill,	16 in. Prentiss.	"
1	20 in. Upright Drill.	"	"
1	23 in.	" " B. G. S. F. Thompson.	New.
1	24 in.	" " Prentiss. New.	
1	30 in.	" " "	"
1	15 in. Shaper.	Gould & Eberhart.	"
1	15 in. Shaper.	Hendey.	"
1	Pratt & Whitney No. 2 Screw Machine.		Fair order.
	Full assortment Milling Spindle Drills, &c, of Garvin's.		New.
1	Universal Tool Grinder.	D. Slate.	New.
1	Schlenker Bolt Cutter to take sizes from ¼ to 1¼ inches inclusive.		New.
2	No. 2 Lincoln Millers.		Good order
1	Nut Tapper, 7 Spindles.		New. Durrell.
1	Hand Lathe, 12 x 4, 5 and 6 ft.		New.
1	2000 lb. Steam Hammer.		A1 order. Sellars.

NEW YORK AGENCY OF THE TANITE CO., AND GRANT & BOGERT MACHINE TOOL WORKS.

H. PRENTISS & COMPANY, 42 DEY ST., N. Y.

GEORGE WESTINGHOUSE, Jr., President,
RALPH BAGALEY, Sec'y and Treas.
H. H. WESTINGHOUSE, Superintendent.

The Westinghouse Engine



Requires neither **Adjustment, Lining, Keying up, Packing, Oiling, or Wiping,** and **Dispenses entirely with Skilled Engineers.** 2 to 150 Horse Power.

Send for Illustrated Circular.

THE WESTINGHOUSE MACHINE CO.,
92 & 94 Liberty Street, New York.
WORKS AT PITTSBURGH, PA.

Second-Hand & New MACHINERY.

Sept. 5, 1882.

The following New and Improved Machinists Tools are part of what we have for early delivery

1	42 in. Swing, 16 ft. bed.	New Engine Lathe.	Sept. 5.
1	26 in. swing, 14 ft. bed.		Sept. 10th.
1	32 in. x 8 ft.	Planers. New.	Sept. 1st.
1	38 in. x 10 ft.	" "	" "
1	38 in. x 12 ft.	" "	" "
2	12 in. stroke Slotting Machines.	New.	Oct. 10.

The following on hand:

1	26 in. swing, 12 ft.	Bed Engine Lathe.		
1	22 in. "	13½ ft.	" "	New.
1	22 in. swing, 11¼ ft.	Bed Engine Lathes.		New.
2	22 in. "	12 ft.	" "	
4	19 in. "	8 ft.	" "	"
2	18 in. "	8 ft.	" "	"
5	15 in. "	6 ft.	" "	"
1	Square Arbor Fox Lathe.	New.		
1	12 in. swing, 6 ft.	Hand Lathe.	New.	
1	10 in. "	4½ ft.	Bed Hand Lathe.	New.
2	30 in. x 8 ft.	Planers.	New.	
1	26 in. x 7 ft.	Planer.	New.	
1	26 in. x 5 ft.	"	"	
1	22 in. x 4 ft.	Planer.	New.	
2	38 in.	Swing Upright Drills.	B. G. & S. F.	New.
1	26 in.	Drill.	B.G.&S.F.	New.
1	23 in.	Drill.	B. G. & S. F.	New.
1	23 in.	"	Plain.	
1	18 in.	Bench Drill.		
1	4 spindle	Drill.	New.	
1	3	"	"	
2	4	"	"	Second-hand.
2	Wall Drills, heavy.	Second-hand.	60 in	
2	12 in.	Shapers.	New.	
2	15 in.	"	"	
1	Sellers Milling Machine.	2d-hand.		
1	Face Milling Machine.	Second-hand.		
1	Pond's Double Milling Machine.	2d-hand.		
1	No. ½ Screw Machine.	Wire Feed.	New.	
1	No. 1	"	Brown & Sharpe.	2d-hand
1	Screw Head Slotter.	Second-hand.		
2	Second-hand Profiling Machines			
2	4½ in	Hyde's Patent Centering Machines.		New.
1	Emery Grinder,	2d-hand. for 10 in. Wheels.		
1	Bolt Pointing Machine.	Second-hand.		
1	Double Nut Tapper.	New Horizontal.		
1	Horizontal Boring Machine,	10 in. Swing.	2d-hand.	
3	Double-Acting Presses,	No. 3, nearly new.		
4	Single-Acting Presses,	for power,	"	
100	Foot Presses,	nearly new.		
2	Small Power Punching Presses.	Second-hand.		
1	Foot Punch,	with bench.	New.	
1	Lot Pistol Machinery.	Second-hand.		
1	Steam Hammer.	Cylinder 6½x12.	2d-hand.	

Lot of Forges 1 Railway Saw Bench, 1 Foot-power Circular Saw.

Cold Rolled Shafting, Pulleys, Hangers, Couplings, &c., always in store.

The George Place Machinery Company,

121 Chambers and 103 Reade Sts., New York.

A Treatise on the Construction and Use

— OF —

UNIVERSAL MILLING MACHINES,

AS MADE BY

BROWN & SHARPE MF'G CO.

PROVIDENCE, R. I., U. S. A.

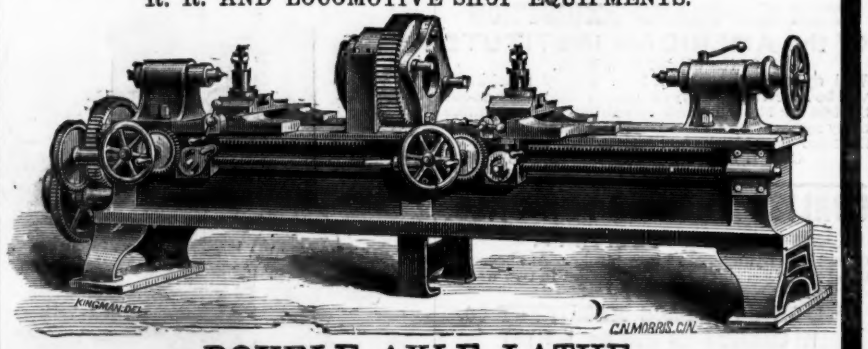
Manufacturers of Fine Machinery & Machine Tools.

FULLY ILLUSTRATED.

SENT BY MAIL ON RECEIPT OF $1.60.

CAR WHEEL AND AXLE MACHINERY,

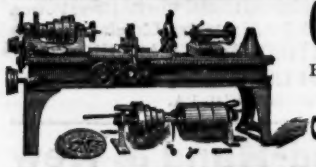
R. R. AND LOCOMOTIVE SHOP EQUIPMENTS.



DOUBLE AXLE LATHE.

NILES TOOL WORKS, HAMILTON, OHIO.

EASTERN WAREROOMS, 22 S. SIXTH ST., PHILADELPHIA, PA.



GRAY'S PATENT 19 IN. LATHE.

Built to Standard Gauges and Templates, with Special Machinery.

EVERY MACHINE BELTED AND TESTED.

G. A. GRAY, Jr., & CO., 17 EAST 8TH STREET, CINCINNATI, O.

Engine Lathes, Planers, Drills, &c.

DAVID W. POND, Worcester, Mass.

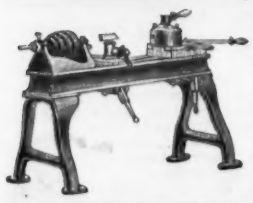
Send for Catalogue of New Designs.

HARTFORD STEAM BOILER INSPECTION AND INSURANCE CO.

J. M. ALLEN, PRESIDENT.

W. B. FRANKLIN, VICE-PRESIDENT.

J. B. PIERCE, SECRETARY.



LODGE, BARKER & CO., Cincinnati, Ohio

Manufacturers of 18 in. Engine Lathes and Turret Lathes.

We are prepared to furnish special tools for making valves, lubricators, compression cocks, &c, at reasonable prices. With our special tools this Turret Lathe is capable of a duty of 300 valves per day of 10 hours.

CIRCULARS AND PRICES FURNISHED ON APPLICATION.

EXINUTILI TRADE TANITE MARK UTILITAS

Emery Wheels & Grinding Machines.

THE TANITE CO.

Stroudsburg, Monroe County, Pa.

Orders may be directed to us at any of the following addresses, at each of which we carry a stock:

New York, 43 Dey St.
Chicago, 152 & 154 Lake St.
Chicago, 40 Franklin St.
Minneapolis, 254 Second Ave., South.
Philadelphia, 925 Market St.
Boston, Cor. High & Oliver Sts.
St. Louis, 209 North Third St.
St. Louis, 811 to 819 North Second St.
Cincinnati, Cor. of Pearl & Plum Sts.
Pittsburgh, 137 First Ave.
Indianapolis, Cor. Maryland & Delaware Sts.
New Orleans, Cor. Union and St. Charles Sts.
San Francisco, 2 & 4 California St.
Portland, Oregon, 43 Front St.
Liverpool, Eng., 42 The Temple, Dale St.
Sydney, N. S. W., 17 Pitt St.

The Pratt & Whitney Co.

HARTFORD, CONN., U. S. A.

MANUFACTURERS OF

MACHINISTS' TOOLS,

GUN AND

Sewing Machine Machinery.

MAKE SPECIALTIES OF

SHAPING MACHINES,

PILLAR SHAPERS,

Power Planers

16 x 16 to 48 x 48 inches square, and various lengths. All feeds automatic.

SEND FOR ILLUSTRATED CATALOGUE AND PRICE LIST.

DROP FORGINGS

Of Every Description, from 1-16 ounce to 30 lbs. weight, for

Guns, Pistols, Sewing Machines, Machinists' Tools,

AND MACHINERY GENERALLY.

The Pioneers as a specialty in this line of business. Estimates given promptly on receipt of models Send for Catalogue and Descriptive Circular.

THE BILLINGS & SPENCER CO.

HARTFORD, CONN., U. S. A.

GRANT & BOGERT,

FLUSHING, L. I., N. Y.

MANUFACTURERS OF

FIRST-CLASS

MACHINE TOOLS.

ROP HAMMERS

Punching Presses DIES AND OTHER TOOLS For the manufacture of all kinds of SHEET METAL GOODS, DROP FORGINGS, &c. Gilles & Parker Press Co.

SPECIAL MACHINERY

Built to Order, and

TOOLS OF ALL KINDS,

Shop well furnished for good work.

S. Mc HENRY, 927 FILBERT STREET, PHILADELPHIA.

E. E. GARVIN & CO.

139 & 141 Centre St., New York.

MANUFACTURERS OF

MACHINISTS' TOOLS,

Milling Machines,
Drill Presses,
Hand Lathes,
Tapping Machines,
Cutter Grinders, &c.

SEND FOR NEW ILLUSTRATED CATALOGUE containing descriptions of the above machines.

GEO. W. FIFIELD,

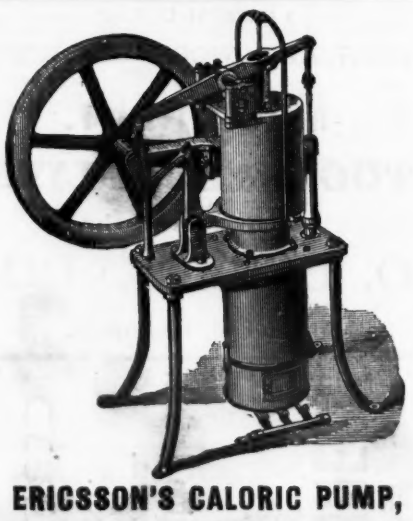
MANUFACTURER OF

ENGINE LATHES

FROM 16 to 48 IN. SWING.

Cuts, Photographs and Prices furnished on application.

Lowell, Mass, U. S. A.

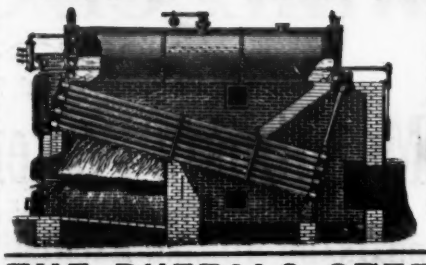


ERICSSON'S CALORIC PUMP,

C. H. DELAMATER & CO., 10 Cortlandt St., New York.

BABCOCK & WILCOX WATER-TUBE STEAM BOILERS.

Adapted for all Purposes. Safe from Explosions.



3,673 H. P. in use by SINGER MF'G CO., New York; 3,790 H. P. by HARRISON HAVEMEYER & CO., Philadelphia; 2,880 H. P. by DECASTRO & DONNER SUGAR REFINING CO., Brooklyn; 4,800 H. P. by AMERICAN GRAPE SUGAR CO., Buffalo; 1,350 H. P. by THE JESSUP & MOORE PAPER CO., Wilmington; 720 H. P. by RARITAN WOOLEN MILLS, New Jersey; 600 H. P. by STUDEBAKER BROS. MF'G CO., South Bend, Ind., and hundreds of others in all kinds of business, from 50 H. P. to 2,000 H. P. each.

Centennial Exposition Medal awarded this boiler for highest economy and efficiency on test.

Illustrated Circulars and other desired information promptly furnished.

BABCOCK & WILCOX CO.
30 Courtlandt Street, New York.

THE BUFFALO STEEL FOUNDRY, BUFFALO, N. Y.

PRATT & LETCHWORTH, Proprietors.

Orders and correspondence solicited.

J. M. CARPENTER PAWTUCKET, R. I.

MANUFACTURER OF

TAPS & DIES